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FEDERAL PUBLIC LAND LAWS AND POLICIES RELATING TO INTENSIVE AGRICULTURE
VOLUME II (RESOURCE STUDY)

The Economics Department
Agricultural Experiment Station
South Dakota State University

Revised October 1969

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Federal Public Land Laws and Policies Relating to Intensive Agriculture

VOLUME II

The Legal Study of Federal Public Land Laws and Policies Relating to Intensive Agriculture constitutes Volume I of this two-part study report.

FINAL REPORT

Prepared for the
Public Land Law Review Commission
Washington, D. C.

By
The Economics Department
Agricultural Experiment Station
South Dakota State University
Brookings, South Dakota 57006

APRIL 30, 1969

REVISED OCTOBER 1969

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Prepared under contract with the Public Land Law Review Commission.

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This publication constitutes only one of a number of sources of information utilized by the Commission in the conduct of its public land study program.

* * *

NOTE TO THE READER: As originally submitted by the contractors this report consisted of a legal study, published in one volume and a resource study published in seven volumes. As republished by Clearinghouse the study has been combined into four volumes. Volume I consists of the legal study, Volume II contains the resource portion of the study and Volumes III and IV contain the working papers and appendices to the resources study.

Public Land
1730 K Street, N.W.
Washington, D. C. 20006

October 15, 1969

Honorable Wayne N. Aspinall
Chairman
Public Land Law Review Commission
Washington, D. C.

Dear Mr. Chairman:

Transmitted herewith is a two-part study of Federal Public Land Laws and Policies Relating to Intensive Agriculture. The legal portion of this study, so titled, was prepared under contract by the law firm of Kronick, Moskovitz, Tiedemann & Girard of Sacramento, California. The resource portion was prepared under contract by the Department of Economics of South Dakota State University.

The contractors' report was originally submitted to you with our letters of April 30 and June 2, 1969. After you made copies available to the members of the Commission and the Advisory Council and Governors' Representatives, the manuscripts were reviewed and comments were received from the two latter groups. In addition, our staff has reviewed the manuscripts. The contractors were then furnished with all the comments so that inaccuracies could be corrected. 1/ However, since this is their report and not that of our commentators, we have not requested any changes based on interpretations or opinions unless the contractor agreed with those interpretations or opinions.

As originally submitted by the contractors this report consisted of a legal study, published in one volume and a resource study published in seven volumes. As republished by Clearinghouse the study has been combined into four volumes. Volume I consists of the legal study, Volume II contains the resource portion of the study and Volumes III and IV contain the working papers and appendices to the resources study.

1/ The comments referred to are part of the official files of the Commission. When the Commission ceases to exist, these files will be deposited with the National Archives, Washington, D. C.

Together, the legal and resource portions constitute a study designed to provide the Commission with a comprehensive understanding of the existing laws, policies, practices and problems relating to agricultural use of Federal public lands, the effects of the present system, and possible alternatives to it.

Included in the legal portion of this report is a description of the existing Federal statutory and regulatory systems for disposing and leasing of public lands for agricultural purposes. Judicial and administrative decisions interpreting these systems have been analyzed and described. For purposes of comparison, the study includes a brief description of the systems of selected states for the disposal of lands for agricultural purposes. Also included is a listing and discussion of possible alternatives to and modifications of the existing Federal systems.

To provide the resource background, there is presented information on what has actually happened under the various laws and attendant policies through which Federal public lands are made available for disposal for intensive agriculture. These include, most importantly, the original and enlarged Homestead Acts, the Desert Land Act, and the Reclamation Homestead Act. The contractors also analyzed the leasing of Federal lands for intensive agriculture.

Considerable effort was devoted to the study of problems associated with transferring Federal public lands to private ownership under the Homestead and Desert Land Acts in recent years.

The resource contractor has brought together in a single place for the first time estimates of Federal public lands suitable for intensive agriculture. These estimates are divided into lands suitable for dry land farming, lands suited for irrigated agriculture for which water is presently available, and lands suited for irrigated agriculture for which water is not presently legally or physically available.

Then, existing and potential demand for agricultural products both domestic and international, are related to the potential output of agricultural products from Federal public lands. The effect of existing price support and land retirement programs is considered.

The changing nature of labor and capital requirements in modern agriculture, the optimum size of farms, and the impact on local communities of bringing new lands into agricultural production are all examined in some detail in the study. Consideration is also given to expenditures necessary to make water available for irrigating public lands, and to acreage restrictions in the public land laws.

The report shows that many of the lands transferred in recent years under the existing public land agricultural settlement laws are in fact highly valuable for agricultural purposes. However, limits on the amount of available water under state water laws have sharply restricted the total area that can be put into agriculture. Other nonprice restrictions, such as those dealing with corporate or other combinations of ownership, also limit this area. Establishing a price for transfer of public lands for agricultural purposes is also noted as a difficult policy problem. These basic policy considerations have emerged from our review of this subject:

[illegible] discussed the effects of these laws.

1. What objectives, if any, justify a policy of intensive agricultural use of Federal public lands?

   a. Should Federal lands be allocated to intensive agricultural use if this use is higher valued than existing uses and thus would tend to maximize the rate of economic growth?

   b. Should Federal public lands be made available for intensive agricultural use in order to stimulate the growth of local and regional economies?

   c. Is agricultural commodity production from Federal public lands necessary to meet the demand for agricultural products?

   d. Should Federal lands be made available for intensive agricultural use in order to stimulate urban to rural migration?

2. Under what terms and conditions should Federal public lands be made available for intensive agricultural use?

   a. Should transfers of Federal lands to private ownership or use be made at market prices?

      (1) Are below market prices for land justified by objectives of regional growth or economic efficiency?

      (2) Should any Federal lands allocated to intensive agricultural use be subject to existing subsidy programs, such as price supports or land retirement programs?

   b. Are there specific conditions in which leaseholds rather than freeholds should be used?

      (1) Should Federal lands suitable for dryland farming be made available through leaseholds rather than freeholds?

      (2) Should agricultural leaseholds be permitted on Federal lands held primarily for other national purposes?

      (3) Should lands acquired under the Bankhead-Jones Act be treated the same as public domain lands for purposes of intensive agricultural use?

   c. What procedures should be established for determining the specific Federal lands that are suitable for and should be allocated to intensive agriculture?

      (1) Should the determination of Federal lands suitable for intensive agriculture be made by state agencies in the state in which the lands occur?

      (2) Should state governments certify potential agricultural use of Federal lands according to the availability of state water rights?

      (3) Should state and/or local governments certify potential agricultural use of Federal lands according to their economic development plans and zoning regulations?

      (4) Is there any need to guard against speculation in Federal lands by policing against nonagricultural uses of Federal lands after transfer to private ownership?

   d. Should the amount of land transferred from Federal ownership to a single owner for intensive agricultural use be subject to acreage restrictions?

The staff project officer on the resource portion of this study was Don A. Seastone, with Eugene E. Hughes as associate project officer. The legal portion of the study was conducted under the supervision of Joe W. Ingram as staff project officer.

Sincerely,

Milton A. Pearl
Director

Enclosures

ACKNOWLEDGEMENTS

Many fine people cooperated and assisted with this study. Although they do not bear the responsibility for the findings and statements in this report, they did make it possible for the study to be made and the report to be published. At the risk of unintentionally omitting the names of deserving organizations or individuals, we express our appreciation to the following:

The staff of the Public Land Law Review Commission particularly Mr. Milton A. Pearl, Director; Mr. Charles Conklin, Assistant Director for Programs; Dr. Don A. Seastone, Project Officer; Dr. Eugene E. Hughes; Mr. Joe W. Ingram; Mr. James P. McAleer; and Dr. Thomas R. Waggener.

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  Soil Conservation Service
  Agricultural Stabilization and Conservation Service
U.S. Department of Defense
  Department of Air Force
  Department of Army
  Department of Navy
U.S. Department of the Interior
  Bureau of Land Management
  Bureau of Sport, Fisheries and Wildlife
  National Park Service
National Aeronautics and Space Administration

A considerable number of State and county officials in several Western States who provided information and assistance in locating lands, people and data.

A large number of farmers, landowners, business people, and other citizens who provided information concerning experiences related to public lands.

University professors from a number of institutions who provided reference materials and advice.

The firm of Kronick, Moskovitz, Tiedemann and Girard of Sacramento, California, contractor for the legal study on intensive agriculture and particularly, Mr. Edward J. Tiedemann for advice and assistance concerning our descriptions of laws and regulations.

Mr. Ingebert Fauske, Quinn, S. D., the representative of the Governor of South Dakota to the Public Land Law Review Commission, for advice and suggestions with particular attention to the Land Utilization Act.

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Subsequent to the initiation of this project, South Dakota State University established on September 1, 1968, the Institute of Social Sciences for Rural Urban Research and Planning. Thereafter, the Institute was associated in the conduct of this study. The staff of the project included:

Max Myers, Project Coordinator, Professor of Economics and Director, Institute of Social Sciences on Rural Urban Research and Planning
Russell L. Berry, Deputy Project Coordinator, Associate Professor of Agricultural Economics
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Federal Public Lands: Their Disposal and Permitted Use, 1934-67

Federal Public Lands: Economics of Farm Size in Western United States

Federal Public Lands Suited for Intensive Agriculture in Western United States

Federal Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980-2000

Federal Public Lands: Probable Effects of New Cropland on Local and Regional Economies in Western United States

Federal Public Lands: Goals, Issues and Alternatives

A Brief Summary

This study is part of the research being done by the University under contract with the Public Land Law Review Commission. The opinions, findings, conclusions and data expressed in this publication are those of the authors and not necessarily those of the Public Land Law Review Commission. This publication constitutes only one of a number of sources of information utilized by the Commission in the conduct of its public land study program.

A BRIEF SUMMARY

Summary of a report prepared for the Public Land Law Review Commission, 1730 K Street, N.W., Washington, D.C. 20006, by South Dakota State University, Brookings, S.D. 57006, April 30, 1969.

This study is part of the research being done by the University under contract with the Public Land Law Review Commission. The opinions, findings, conclusions and data expressed in this publication are those of the authors and not necessarily those of the Public Land Law Reveiw Commission. This publication constitutes only one of a number of sources of information utilized by the Commission in the conduct of its public land study program.

Most Americans give little thought to the Federal Public Lands. Those who do so usually have special interests as users, administrators or conservationists. Consequently, their views vary greatly regarding the use that should be made of these lands.

These conflicts in views are not new although some aspects of the situation receive more or less attention now than once was true. When our nation was young and struggling to survive between the Atlantic Ocean and a wild continent most of the known public lands were considered suitable for farming. A family with strength and determination could develop both a home and a farm on such lands and many families did so. As the settlers pushed westward for the first thousand miles -- and the first hundred years -- these opportunities continued to exist.

With the successive waves of land seekers varying patterns of settlement, land use, and farm organization emerged in response to physical, economic, political and legal conditions. These conditions developed into an elaborate pattern of laws and procedures relating to settlement and use of federal public lands. For the most part this pattern was intended to bring about the transfer of these lands into private ownership and into intensive agriculture under independent farm family operation.

As time went on and the frontier moved westward, the nature of the lands changed. They were less suitable for intensive farming unless irrigated, and water resources were less plentiful. Development became more difficult and costly. A grazing agriculture requiring larger units of land became more necessary. Minerals, forests, and scenery grew relatively more important. Some reservations of public land for public purposes were made and on some of these lands multiple use is permitted.

However, the patterns of laws and procedures, although enlarged and changed somewhat, still reflected the earlier emphasis on disposals for intensive agricultural use by family farmers even though fewer such opportunities remained.

The most recent comprehensive effort to evaluate the situation and recommend any necessary modifications in our laws and procedures relative to federal public lands was initiated with the creation of the Public Land Law Review Commission.

The Commission's responsibility is to (1) "study existing statutes and regulations governing the retention, management, and disposition of the public lands"; (2) "review the policies and practices of the federal agencies charged with administrative jurisdiction over such lands insofar as such policies and practices relate to the retention, management, and disposition of these lands"; and (3) "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist within the foreseeable future."

The Commission outlined a series of studies, including this one, to provide a basis for carrying out the directive that it recommend to the President and the Congress "such modifications in existing laws, regulations, policies, and practices as will, in the judgment of the Commission, best serve to carry out the policy" that "the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide maximum benefit for the general public."

Federal lands suited for intensive agriculture or tilled crops have more importance in any study of public land laws than seems justified by the relatively small amount currently in such use. There are several reasons for this importance. Historically, the purpose of the disposition of the public domain was its development as privately owned and operated farms. A major part of land law legislation and regulations related to this aim. Currently, some of the more challenging questions and controversies concern the development of public lands for intensive agriculture, usually through irrigation. Costs of development are rising sharply, economies of scale are becoming more important, and laws such as the 160-acre limitation are under attack.

This is a study concerned with people as well as lands, policy decisions, and laws. People make the public land problems as well as the policies and the laws. They sometimes act ahead of the policies and the laws. They demand that their representatives in government evaluate the situation and do something about it.

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Who are these people that influence actions and policies regarding public lands suitable for farming? For purposes of simplification they may be divided into three groups: the users, the administrators, and other publics. The users include those who use these lands for private or economic purposes or would like to do so. The administrators are the federal officials in the agencies which supervise the lands. The other publics may be sorted out in various ways -- geographically, as taxpayers, as consumers, or as voters.

What do these people in these various groups want from the public lands? Each major interest group has its own goals and objectives. These are not always consistent even within the group, and they sometimes conflict with those of other groups. Conflicts between groups over objectives and alternatives give rise to issues.

Most of the user groups tend to stress economic goals and objectives. These people want to make a living and they want to use the public lands, or former public lands, profitably. User groups interested in sport or recreation, however, may emphasize other types of objectives.

The administrative agencies tend to seek such objectives as:

More efficient or more economical ways of carrying out assigned responsibilities.
More (or less) personnel and funds (as current policies dictate).
More (or less) lands to administer (as current policies dictate).
More (or less) control over the lands and users thereof (as current policies dictate).
More (or less) revenue from the lands (as current policies dictate).
Public recognition for their efforts.
Conservation or preservation of the lands and features thereof.

Various other public groups may have such diverse objectives as:

Economic development and better business in an area or region.
Obtaining more revenue from public lands or lowering public costs to maintain such lands.
Placing of public lands on tax rolls through putting them in private hands (or obtaining this result by federal payments to lower governments).
Obtaining more food or other products from public lands.
Conservation or preservation of the lands and features thereof.
Development or continuation of some selected pattern of settlement or of society.

Each of these groups with its objectives tends to consider, select, and support courses of action to attain those objectives. These alternative courses of action usually concern utilization of lands, the form of tenure, costs and revenues, the time element, or some combination of these.

When the chosen course of action of a group conflicts with the existing system of laws and regulations or with the courses of other groups, there are problems (or policy issues) for everyone concerned. Then by some process the issues must be resolved. This leads to study, discussion, negotiation, or legislation. Quite often some sort of compromise solution is developed.

There are many ways in which current major issues relating to public lands can be described, divided and analyzed. For purposes of this report a very simple and practical approach is used; major issues are grouped under the following three policy questions with various subordinate questions:

Should federal public lands suitable for intensive agriculture be used for that purpose?

If such lands are to be so used, how should this be accomplished?

If such lands are not to be so used, how should this be accomplished?

In this brief summary these three questions are treated in the order listed with the relevant data and evaluations presented as needed. In other portions of the Final Report and in the Working Papers there are more complete presentations of data and analyses.

Should federal public lands suitable for intensive agriculture be used for that purpose? Why?

A number of reasons have been advanced to support the agricultural use of these lands. These reasons include:

Production of food and fiber for the nation and the world.
Economic development of specific regions, States, and communities.
Settlement (occupancy) of the lands.
Establishment of proprietorships (or family farms) on the lands.
Supplementation of some other use.
Provision of government revenues from these lands.

Do we need these lands in order to produce foods or fiber? Shall we need them by 1980? By 2000? Answers to these questions depend upon the amounts and types of suitable and available public lands as well as the overall demand for and the supplies of food and fiber.

This study tabulated the acreages of public lands suitable for intensive agriculture and supervised by seven federal agencies in the 17 contiguous Western States in three categories:

Dryland: 1,995,604
Irrigation (water available): 1,312,639
Irrigation (water not available): 35,068,041

Some of these lands are in parks and forests and not likely to be available for cultivation. A more limited tabulation of suitable and potentially available lands under control of the Department of Defense, Bureau of Land Management, and Bureau of Reclamation shows:

Dryland: 705,000 acres
Irrigation (water available): 941,000 acres

These arable lands are scattered widely over the Western States, and about 1,010,000 acres are now being cultivated by private operators under lease or permit.

The quantities of land considered suitable and available are relatively small when compared with the total of 371,000,000 acres administered by federal agencies, or the total of 300,000,000 acres of private croplands in the United States.

Data and estimates on current and projected demands for food and fiber for the United States and the world were studied. The years 1980 and 2000 were used as future reference points. In addition, information on amounts and productivity of cropland in the United States was analyzed. Particular attention was paid to privately owned but unused or underdeveloped arable lands.

The conclusions reached were as follows:

1. While world population is expected to double by the year 2000 and thus create unprecedented demands for food, demands in the underdeveloped countries must be met, except in time of drought or disaster, by local production.

2. The U.S. contribution to food and fiber needs of other countries will be maximized by providing fertilizers, insecticides and other chemicals, seeds, tools, and technical help rather than food.

3. The demand for U.S. agricultural production will continue to be largely limited to the needs of the domestic population and the developed countries that find it profitable to import our foods, feeds, and fibers.

4. The U.S. population is expected to increase about 25 percent by 1980 and 75 percent by 2000.

5. A study made for the National Advisory Commission on Food and Fiber by Professor Earl Heady and Leo Mayer of Iowa State University indicates that, despite expected rises in population and foreign demand, the increase in yields and efficiency will be so great that no more than 20 million of the 60 million acres of idle cropland will be called back into productivity by 1980.

6. A survey by the Soil Conservation Service indicates that out of the 638 million acres of land suited for regular crop production in the United States in 1958, 373 million acres were cropland. Currently only 300 million acres of cropland are being harvested, and 60 million acres have been retired from production by government programs.

7. Even if there were little or no increase in yields and technology, U.S. food and fiber needs of the year 2000 could be easily met by increasing crop acreage from 300 million to 600 million.

8. Of the 371 million acres of federal public lands, only 3.3 million acres are deemed arable or suitable for crop production by the seven federal agencies that now administer these lands; only 705,000 acres suited for dryland crop production and 941,000 acres suited for irrigation are likely to be available. These are lands held by the Bureau of Land Management, Bureau of Reclamation and the Corps of Engineers. The contribution of these 1.6 million acres of federal lands to food and fiber production needs would be very small indeed.

9. The Bureau of Reclamation estimated the cost of future federal irrigation projects at $921 an acre and non-federal projects at $313 an acre. Both these costs exceed clearing and draining costs for millions of acres of land in humid areas of the United States. The latter would seldom exceed $200 an acre.

10. The evidence indicates that U.S. agriculture can easily meet food and fiber needs for both 1980 and 2000 without the use of the 1.6 million acres of federal lands considered suitable and available for crop production.

Although the foregoing information provides no justification from the national, economic viewpoint, there remain questions concerning specific major crops, specialty crops with local demand, and public lands already in production. None of these alter significantly the conclusions already listed, but they do pose possible, localized exceptions to the general conclusions.

The second justification listed for development of these public arable lands is to aid in the economic development of specific regions, States, or communities. Such justification has some basis in the obvious fact that any development which brings in outside capital and additional people will create some business activity at least in the short run.

The real questions in this subject area concern the amount, geographic distribution, and duration of such benefits as related to available and suitable federal lands. Will such development, presumably with federal investments in selected localities, be of such value as to serve the national interest? Or will it provide such local and area benefits as to justify efforts to accomplish it even though it may not be in the national interest?

Several input-output studies in 11 Western States suggest that for every $100 of new crops produced there would be $30 to $40 indirect benefits or total effects of $130 to $140. Thus if the 1.5 million acres of arable public lands were brought into production at present yields and prices, the direct output effect would be $85 million. If the indirect effect multiplier were $1.36, the total effect would be $115 million. Large as this is, it would be only a 2.0 percent increase in the value of all crops presently harvested in these 11 States.

Similar results could be expected in local communities. For example, if in Phillips County, Montana, 23,500 acres of arable federal lands could be brought into production, the direct effect at current yields and prices would be $352,000 or a 3.9 percent increase over current agricultural sales. If the indirect effect multiplier were 1.30, the total effect would be $458,000 a year.

If 30,000 acres of new federal lands were brought into irrigated production in Cassia County, Idaho, the direct effect would be about $5 million increase as compared with $33 million presently produced. If the 1.30 multiplier were used for the indirect effects, the total effect would be about $6.5 million. Obviously this would have an important impact on the local community. But such an analysis gives at best only a partial answer. What would be the effects of similar development in other parts of the country if lands there can be developed more cheaply with less subsidy? What would be the comparative effects of developing other industries in these communities or States? These are questions

that need to be answered before arable public lands are developed for the sake of local economies; however, they can be answered only by careful analyses of probable costs and benefits of the alternatives under specific circumstances of a given community. No easy answers are available.

Settlement of the public lands has been a goal in itself at times in our history. Is this purpose relevant today?

In earlier periods of our nation's history, the settlement of new lands principally for political or military reasons was an objective in its own right. Does this hold true for today and tomorrow? The earlier military and political justifications probably do not apply to most areas of the 48 contiguous States. However, looking toward the future, some attention must be paid to various proposals to reduce population pressures on large urban centers by settling more people on public lands in sparsely populated areas.

How many new families could be supported by these lands? A review of farm size studies indicated that if $5,000 is considered a minimum acceptable farm income, then 1,000 to 2,500 acres of dry cropland would be needed--depending upon the productivity of the land, its location, and other assumptions. Thus if an average of 1,000 acres per farm is required for a minimum adequate income, the development of 0.7 million acres for dryland crops would produce 700 new farms and would support that many farmers.

If the 0.9 million acres of irrigable public lands were divided into 300 acre farms, then about 3,000 new farmers would be required in the 17 Western States. Studies of farm size in the West indicate that 300 acres would produce about $5,000 net returns to the farmer for his labor and management. If 700 additional dryland farms plus 3,000 new irrigated farms, were to be occupied by families of four persons, this would be 14,800 additional people.

The establishment of proprietorships (or of family farms) has been used as a justification for development of the public lands. At times national policies to encourage ownership by establishing independent farmers (or family farms) has received strong support. Does this objective in itself justify putting the arable federal lands into intensive agricultural use?

Individual private ownership still is an objective of a large number of citizens, and particularly so among farmers. National and State government officials reiterate support, in words at least, of this objective. To some extent the existing homestead type laws reflect this objective. However, as shown elsewhere in this report, such laws now are seldom used and then with difficulty.

At present, the opportunity to become relatively low income farmers, even as land owners, does not seem to have effective mass appeal to people in the United States as shown by trends in the number and size of farms. There are about three million farms in the country today, or about half the number of 30 years ago. These are expected to continue to decline to perhaps two million or fewer in the years ahead. Farms producing $10,000 or more in gross marketings annually have increased threefold since 1939 while commercial farms producing less than $10,000 have declined from four million to fewer than one million in the same period.

Obviously the development of 1.6 million acres of arable public lands into approximately 700 dryland farms and 3,000 irrigated farms would make only a small contribution to the preservation of family farms. In view of the fact that more cropland probably will not be needed in the foreseeable future, development of this land to create family farms seems questionable.

Another reason sometimes given for cultivation of arable public lands is to supplement some other use or purpose. Actually, there are local and regional examples of such interrelationships. These include cultivation of crops on wildlife refuges, small scale farming in areas where seasonal labor is needed for lumbering, and production of fresh food adjacent to park and forest resorts. In a much broader sense this category includes production of winter food for range livestock operations. In some cases the feed base is the critical factor of the business, and the available land for such feed production is public land. The extent and impact of these interrelationships were not measured.

Another stated purpose for putting the arable public lands into farming is to provide revenue to the federal government and perhaps to other levels of government. A related aspect of this is possible reduction of costs to the government.

Some citizens feel that federal lands should be sold to bring current revenue to the government. Probably a considerably larger number believe that all suitable lands should be put into private hands and on the tax rolls in order to strengthen local government units as well as to reduce federal costs of supervision and operation. Such views usually are expressed with regard to all public lands rather than to arable lands only or specifically.

With regard to the arable lands, past experience has shown that the disposal of public lands does not provide any large gross revenue to the federal government, and quite possibly, no net revenue. For example between 1934 and 1966 the federal government received only $835,930 from Homestead Act fees, $955,664 from Desert Land Act fees, and $14,609,896 as proceeds from land auctions.

The considerations of potential tax revenues to local governments and of administrative costs were not included in this study. Both are complex matters. Another consideration not studied is the potential cost of other federal public services which would be necessary if additional public lands were developed for intensive agricultural use.

Despite the foregoing uncertainties it can be assured that considerations of potential public revenue or savings will continue to be a force directed at transfer of public lands to private use and ownership.

In summary, the evidence concerning these various reasons for putting public arable lands into cultivation does not seem sufficient to justify a decision to do so on an across the board basis. However, there seems to be justification for intensive agricultural use of some of these lands, and this weakens any case for complete prohibition of cultivation. Since this situation pertains, it becomes necessary to consider various alternatives for putting such lands into intensive use and also for keeping them out of such use as the circumstances may dictate.

If the federal public lands suitable for intensive agriculture are to be used for this purpose, how should this be accomplished?

Selected issues and alternatives are discussed under this general policy question. The selection was arbitrary but based on suggestions from staff members of the Commission, the legal contractor and other advisors. The alternatives are not intended to be recommendations. The statements concerning legal points and alternatives are brief because of the existence of the report by the contractor for the study on the legal aspects.

The selected issues are discussed in three groupings as they relate to utilization; tenure; and price, cost, and revenue considerations. These issues are stated in the form of questions.

Utilization Considerations

Which public lands should be developed for use and how should they be classified? Should public lands entered upon for agricultural purposes be restricted to agricultural use? Should these restrictions be upon types or sizes of intensive agricultural units developed on public lands?

Until 1934 the location or selection of lands as suitable for crop production was left largely, but not entirely, to the settlers. The Taylor Grazing Act of 1934, the 1964 Classification Act, and the 1964 Public Land Sale Act do not permit entry of a settler until the land is classified as chiefly valuable for agriculture and opened for entry under one or more of the agricultural disposal laws. There has been criticism of the situation which permits the Secretary of the Interior to be both the policy maker and the administrator of policy. A suggested alternative is the creation of an independent board to select and classify the lands.

In recent years there has been criticism over the cases where arable public lands entered upon and patented under agricultural acts soon become real estate developments or other non-agricultural sites. In some instances these activities have become a burden on local services or have been considered undesirable. Efforts to stipulate and control the future use of public lands after title has passed to private owners could be difficult and quite possibly undesirable. A title thus restricted could freeze the land in a less than optimum use or substantially lower its market value. No formal alternative is proposed because this issue was not studied in depth.

Various public land acts place limits (160 or 320 acres) upon the amount of public lands which can be acquired by one settler. If the object of the various homestead and desert land laws is to create viable family farms, these limits may contribute to the defeat of this effort.

Apparently, another purpose of such acreage restrictions was to prevent any one person from acquiring large amounts of public lands, especially where rather large public investments had been made, as on public irrigation projects. There are variations and unintentional discriminations in the application of these limitations. Removal of the limitations is presented as an alternative.

Tenure Considerations

Should the Homestead and Desert Land Acts be repealed? Should arable public lands be disposed of as freeholds or as leaseholds? Should arable public lands be transferred to States for retention or disposal? Should State and local governments have a larger voice in policy decisions affecting (1) land settlement (2) use of water and (3) additional costs to State and local governments as a result of land development?

The operations of these land laws have been severely criticized by applicants, administrators, and research workers. About two-thirds of the lands disposed of by the federal government are by sale. Only about one-sixth is disposed of by homesteads and one-sixth by desert land entries.

Only about 200 homesteads and 150 desert land entries per year have gone to patent in the 17 Western States since 1934. An alternative is suggested for repeal of the Homestead and Desert Land Acts but with continuation of the Public Land Sale Act of 1964.

From the farmer's viewpoint the main advantage of the freehold is that it is capable of providing the maximum degree of security and freedom. From the standpoint of the government, granting the freehold provides relief from many difficult, cumbersome, and costly decisions about land management, land use and fair rents. In countries having experience with long term leases of public lands to farmers, there has been a continuing trend toward freeholds. An alternative is suggested that all single purpose agricultural public lands be sold. A comparison alternative suggests modifications in leasing.

The Congress granted 229 million acres of federal lands to States and local government units for many worthy purposes during the period from 1787 to the present time. Most recently Alaska, upon attaining statehood, received the right to select 103 million acres of federal lands. From time to time considerable thought has been given to the possible advantages of transferring part or all of the federal public lands to the States. President Herbert Hoover once expressed the view that the States, all of whom have agencies to manage State lands, "are today more competent to manage" the federal public lands than is the federal government. M.M. Kelso has pointed out that "the record of public land management by States and counties in the West shows no example of public land management of a quality comparable to most of that of the federal government." Australia transferred its public lands to its States in 1891 and Canada its public lands to its Provinces in 1930. In neither case has there been any movement to reverse these transfers. The subject of further transfers of federal public lands to States deserves more study. No alternative is suggested.

Some people suggest that State and local governments need to be given a larger influence on public land policy matters. This issue is closely related to the previously discussed issue of possible federal land transfers to States. Certainly State governments and probably local governments also would have more influence over public land policies if such transfers were made. Actually, the States seem to have a strong influence through the Congress in formulation of national policy concerning such subjects as land settlement and use of water. Their basis for complaints seems to center more on federal operating policies especially on land and water programs, which affect the local citizens and sometimes result in added costs for local and State governments. It seems that channels and methods exist by which local and State interests and governments can influence federal policies of all types. No alternative is suggested.

Price Cost and Revenue Considerations

If arable public lands are to be disposed of as freeholds, what price, if any, should be charged for the land? Should federal investments be made in development of irrigation for arable public lands? What level of public expenditure is necessary to develop the water inputs?

Under the several existing federal acts, charges for public lands vary from small fees to the market price at auction. For example, during the period 1934 to 1966 homestead fees averaged $.12 an acre; desert land charges and fees, $1.32 an acre; and public auctions, $8.99 an acre. Of course, the homestead and desert land laws required services "in kind" on lands that were usually lower in value than these sold at auction. But is it in the public interest to continue to accept payments in kind under the homestead and desert land laws? An alternative previously presented, is repeated--repeal the Homestead and Desert Land Acts and continue the Public Sale Act.

The federal government has made substantial investments in the development of the arid lands of the West, and development costs are increasing. For example, in 1959 the Bureau of Reclamation estimated the average cost of developing 9.5 million acres of new irrigated land at $921 an acre, but the development of 2.7 million acres of new non-federal lands was estimated to cost only $313 an acre. In contrast, there are millions of acres of land that can be cleared of brush, stone, or trees, and drained for less than $200 an acre. The federal government has retired from production about 60 million acres of private land, and it appears that despite the expected increase in population and demand for food, there will still be at least 25 million idle acres by 1980. No shortage of land is expected in the foreseeable future. This means that decisions concerning development of additional arable public lands for irrigated agriculture must take into account these relatively unfavorable economic factors.

If arable public lands are not to be used for intensive agriculture, how can such use be prevented?

Some interest groups propose further limitation, or complete elimination, of intensive agriculture on arable public lands.

The existing system of laws and regulations makes it possible at least in most cases to withhold some arable public lands from intensive use while disposing of similar lands for such uses. This system is rather cumbersome and depends rather heavily on administrative rulings and procedures to accomplish such a purpose.

Two alternatives are posed: the first, previously mentioned, to continue the Classification and Public Land Sale Act of 1964 while repealing the Homestead and Desert Land Acts; the second, to provide permanent legislation prohibiting intensive agriculture on public lands.

And finally--it is difficult to study the American lands and public land laws without some feeling of awe at the scope, diversity and complexity of the lands, the laws, and the problems. Those who must make decisions and recommendations are confronted by interrelated policy problems. However, information gleaned from the nation's long and varied experience with these public lands can help the decision makers. This report on intensive agriculture has been prepared to supply part of that necessary information.

PART I

INTRODUCTION

A. Federal Public Lands and the Objectives of the Public Land Law Review Commission.

B. The Role of Intensive Agriculture.

C. The Concept and Methods Used in This Study.

Federal Lands Included in Study

The Act setting up PLLRC defined in Section 10 the lands to be studied as: all of the public domain; reservations (except Indian reservations) created from the public domain; lands withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws, including the mining laws; outstanding interests of the United States in lands patented, conveyed in fee, or otherwise, under the public land laws; national forests (whether public domain or acquired); and wildlife refuges and ranges (whether public domain or acquired).

Since the programs and problems affecting intensive agriculture are essentially the same on other federal lands as they are on Section 10 lands, and since it was impractical to exclude other federal lands from some aspects of this study, all findings reported herein refer to all of the federal lands in the 49 states.

This study is concerned with all lands owned by the federal government (currently 765 million acres) whether they be original public domain lands that have never left federal ownership or those lands (currently less than 1.0%) which have been acquired by the federal government through purchase, gift, or other means. In this study federal public lands, federal lands and public lands are used interchangably to describe all lands in federal ownership unless otherwise specified. Arable federal lands are those deemed suitable for intensive cultivated crop production.

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A. FEDERAL PUBLIC LANDS AND THE OBJECTIVES OF THE PUBLIC LAND LAW REVIEW COMMISSION

Once upon a time our nation was young and struggling to survive between the Atlantic Ocean and a wild continent. At that time most of the known public lands were considered suitable for farming. A family with strength and determination could develop both a home and a farm on such lands and many families did so. As the settlers pushed westward for about a thousand miles—and a hundred years—these opportunities continued to exist.

During these years a pattern of laws and procedures was developed to permit people to enter upon and earn title to public lands. For the most part this pattern was intended to bring about the transfer of these lands into private ownership and into intensive agriculture under independent farm family operation.

Today we look back toward those times and places as if they all were true fairy tales. With allowances for many hardships and some failures, they were. But we know that the situation changed for more recent settlers and that we cannot write "and they lived happily ever after."

As time went on and the frontier moved westward, the nature of the encountered lands changed. These were less suitable for intensive agriculture on relatively small acreages, unless irrigated, and water resources were less plentiful. Development became more difficult and costly. A grazing agriculture requiring larger units of land became more necessary. Minerals, forests, and scenery grew relatively more important. Some reservations of public land for public purposes were made, but the feasibility of joint uses brought about leases and permits for private operators. However, the patterns of laws and procedures, although enlarged and changed somewhat, still reflected the earlier emphasis on disposals for intensive agricultural use by family farmers even though few such opportunities remained.

More recently the situation has become even more complicated and controversial. We have become increasingly aware that our pattern of laws and procedures may not have kept pace with a changing reality.

Therefore, there has been a series of studies by various public and private bodies established to consider the situation. The history of such activities is available and does not need to be repeated here.[1]

The most recent comprehensive effort to evaluate this situation and recommend any necessary modifications in our laws and procedures relative to the federal public lands was initiated with the creation of the Public Land Law Review Commission.

The Commission, established by the act of September 19, 1964 (Public Law 88-606 78 Stat. 982, 43 U.S.C. 1391-1400), has the statutory responsibility to (1) "study existing statutes and regulations governing the retention, management, and disposition of the public lands"; (2) "review the policies and practices of the Federal agencies charged with administrative jurisdiction over such lands insofar as such policies and practices relate to the retention, management, and disposition of these lands"; and (3) "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist within the foreseeable future."

The Commission outlined a series of studies including this one to provide a basis for carrying out the statutory directive that the Commission recommend to the President and the Congress "such modifications in existing laws, regulations, policies, and practices as will, in the judgment of the Commission, best serve to carry out the policy" that "the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide the maximum benefit for the general public."

B. THE ROLE OF INTENSIVE AGRICULTURE:

Intensive agriculture has more importance in any study of public land laws than seems justified by the relatively small amounts of federal lands currently in such use. There are several reasons for this importance. Historically, the policy has been to dispose of the public domain for development as privately owned and operated farms. A major part of land law legislation and regulations related to this aim. Currently, some of the more challenging questions and controversies concern the development of public lands for intensive agriculture, usually through irrigation. Costs of development are rising sharply, and economies of scale are becoming more important. Hence laws such as the "160-acre limitation" are being questioned.

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[1] Paul W. Gates, History of Public Land Law Development (Public Land Law Review Commission), U.S. Government Printing Office, Washington, D.C., 1968.

In the future, our nation or our world may require the intensive use of some of these physically suitable public lands now reserved for less intensive or non-agricultural uses. This possibility is controversial also. Therefore, it is understandable that the Public Land Law Review Commission designated intensive agriculture as a subject for a separate study. The Commission defined intensive agriculture as "the production of crops other than range forage, including small grains and hay."

In order to place this subject in some perspective, it is necessary to mention briefly several aspects of the situation. Most of these are known in a general way by persons and agencies concerned and will be treated in more detail in subsequent chapters.

1. The quantities of federal public lands now being used for intensive agriculture are small relative to total agricultural lands or to total federal holdings. Additional quantities of federal lands physically suitable for ready agricultural development probably are relatively small also.
2. These lands are scattered over many States and vary in size of tract, quality, and relationship with the local economies.
3. Some of these lands have never been in intensive agricultural use, but others have been so used in the past and have returned to different use categories such as the Land Utilization Project lands, now grazing areas, or lands acquired for forest, park or military uses.
4. Some of these lands have never been in private ownership; others (less than 1%) have been acquired by various means.
5. Some of these lands are reserved for uses other than intensive agriculture, for example national forests or national parks. Some are in areas which permit, or require, multiple uses.
6. These lands are administered by several federal agencies under various statutory and regulatory systems, some of which make little or no provision for intensive agriculture.
7. In the areas where many of these lands are located, there exists a mixed livestock growing and farming economy where many operators utilize both grazing land and cropland, either or both types of which may be in public or private ownership.
8. There often are real differences of opinion locally, regionally and nationally, concerning the relative benefits to be attained by development of federal lands for intensive agriculture as compared with other uses.

It is evident that this subject is complex and is interrelated with ther aspects of the entire subject of public lands. It cannot be eparated neatly and precisely for study, nor can such study be xpected to develop a single, simple answer applicable to all areas or ll problems. It is, however, a subject on which usable information can e gathered and analyzed. The more important problems can be described nd the major alternative courses of action evaluated. This process can elp to illuminate the policy choices before the Public Land Law Review ommission and the nation.

C. THE CONCEPT AND METHODS USED IN THIS STUDY

People come first! People, individually and in various groupings ith their various claims upon the lands or products of the lands, have aused the problems which resulted in laws to regulate persons in relaionship to public lands. Any particular land use, land tenure system, r land law is meaningless unless considered in relation to people hose interests are involved.

The subject matter before the Commission and in this study concerns eople as well as the federal public lands and relevant laws. This eans that the goals and objectives of these people require early and erious consideration in any analysis of the issues and alternatives oncerning these lands. It follows also that the current public lands ituation has political as well as physical, biological, economic, ocial and legal aspects.

Policy decisions come before policy statements, laws and regulaions! The directive to the Commission "to recommend . . . . modificaions in the laws, regulations, policies and practices" is a directive o recommend policy decisions. It is obvious that a policy decision o bring about or prevent some action must underlie and precede the rafting of legislation or regulations.

It is also obvious that some sort of evaluation of the problems, ssues, and various possible choices must precede the making of policy ecisions. Sometimes those who have to make these decisions evaluate he alternatives principally on the basis of the political pressures r numbers of votes involved. On other occasions they conduct studies nd try to make decisions based entirely on objective evaluations of he "facts" and "the national interest." Usually in government decision aking they apply both methods and with judgment. The purely political valuation may be realistic in estimating popular demands but lacking n feasibility on the technical or resource side. On the other hand, esearch studies in seeking objectivity and precision may start from ssumptions which cause the results to lack relevance to actual problems f the people concerned.

The Public Land Law Review Commission outlined this particular study of intensive agriculture in such manner as to provide for analysis of issues and alternatives in a broad sense. However, the contractor is not required nor permitted to present actual policy recommendations because the Commission will perform that function.

It seems necessary to begin this study with a review of the diverse goals and objectives of the various groups of people concerned. Such a review provides a meaningful basis for identifying and analyzing major policy issues which lead in turn to formulation and evaluation of the major courses of action.

WHO are the people with major interests in the federal public lands?

There is no one simple, but usable, answer to this question. The Commission is charged with seeking "the maximum benefit for the general public." However, the "general public" is composed of many interest groups which may overlap each other. Several such major groups can be quickly identified:

a. The users (and would-be-users) of public lands or their products. These are farmers who use public lands under permits for crops or who would like to homestead them, ranchers who want the land for grazing, and non-agricultural users or potential users such as sportsmen, miners, etc. Dealers in lands and others who provide land-related services might be included also.

b. The administrative agencies (and would-be-administrators). These include not only various federal departments and bureaus such as the Bureau of Land Management, but also State government agencies and perhaps other government or private groups.

c. The various other "publics." These can be divided geographically as local, area, State or regional, or national. They can be divided also into those primarily concerned with business, taxation and public finance, consumption of products, or conservation, etc.

WHAT are the major goals (objectives or purposes) of these interest groups?

Here again, there is no one simple, but usable, answer such as "the national welfare" because the national welfare is a composite of many diverse benefits to many diverse groups. Those benefits, as well as their costs, are extremely difficult to measure since some important ones are intangible.

Each major interest group has its own goals and objectives. These are not always consistent even within the group, and they sometimes conflict with those of other groups. Conflicts between groups over objectives and alternatives give rise to issues. It is possible, however, to identify goals and objectives and to relate these to various alternative courses of action from which an interest group might choose.

There is a possible source of confusion in describing goals and objectives. Each person seems to have a chain of these starting with some very general goals and descending through subordinate objectives which might be called either "ends" or "means." However, in a practical but logical way, one can decide rather arbitrarily which to class as objectives and which as alternative means.

Most of the user groups in their relationships to public lands tend to stress economic goals and objectives. These people want to make a living and they want to use the public lands, or former public lands, profitably. User groups interested in sport or recreation, however, may emphasize other types of objectives.

The administrative agencies tend to seek such objectives as:

More efficient or more economical ways of carrying out assigned responsibilities.
More (or less) lands to administer (as current policies dictate).
More (or less) personnel and funds (as current policies dictate).
More (or less) control over the lands and users thereof (as current policies dictate).
More (or less) revenue from the lands (as current policies dictate).
Public recognition for their efforts.
Conservation or preservation of the lands and features thereof.

Various other public groups may have such diverse objectives as:

Economic development and better business in an area or region.
Obtaining more revenue from public lands or less public costs to maintain such lands.
Placing of public lands on tax rolls through putting them in private hands (or obtaining this result by federal payments to lower governments.)
Obtaining more food or other products from the public lands.
Conservation or preservation of the lands and features thereof.
Development or continuation of some selected pattern of settlement or of society.

HOW can each of these groups try to attain its major objectives?

For each of the interest groups and each of its major objectives, it is possible to determine and evaluate the more feasible ways to attain an objective and to arrive at a decision. It is also possible to bring several such evaluations together to help in analyses of issues or controversies between groups.

Alternative courses of action usually concern utilization of lands, the form of tenure, the time element, or some combination of these. Then follows the need for choices to implement decisions with laws and regulations.

Utilization as used here includes the purpose (or purposes) to which the land is put such as crop production.

Tenure includes the terms of ownership, supervision, and operating control of the land. These functions all may be performed by one person or agency, or divided among several.

The time element refers to present versus future development, use or tenure.

As an example of the interplay of factions and purposes, a farmer seeking increased net income may consider producing crops under a permit supervised by a federal agency on land owned by the federal government. Or he may seek to acquire ownership of such land under one of the programs for disposal of federal lands. He may decide to follow one course now and another later. If he chooses to obtain and operate the public land, he seeks to keep the rental (or ownership) costs to a minimum and to attain maximum security of tenure with maximum freedom of choice to operate.

Meanwhile, other individuals or groups of would-be-users such as ranchers, miners, or sportsmen may be considering alternatives which affect these same lands, and their objectives concerning utilization, tenure, and timing may conflict with those of the farmer.

At the same time, the administrative agencies may be seeking objectives by enforcing (or not enforcing) regulations in ways which may assist (or hamper) the efforts of the users and would-be-users. For examples, agency efforts to reserve additional public lands for parks may hamper the farmer while agency efforts to develop new reclamation projects may help him.

Various other public groups may also be exerting pressures which could assist (or hamper) the users and the administrators. For example, the people of a community or region may press for immediate agricultural development of nearby public lands in order to improve the local economy and society. This may assist the user group and affect the administrative agency in various ways. Or conversely, a tax and revenue conscious national "public" may press for high sale or rental prices which could hamper the users, change the policies of the agencies, and make more difficult the development of the local area.

The foregoing example illustrates the complex nature of the public lands situation. Various interest groups push for policies which will be to their benefit. It is assumed that other groups will do likewise for different but equally valid reasons. When they conflict, then there are problems or issues for consideration by the users, the administrators, or the Congress.

There are such conflicts between the interest groups. There are problems and issues relating to the public lands including those lands considered suitable for intensive agriculture. The complexity of the situation poses a three pronged tactical dilemma for those attempting to analyze the issues and alternatives:

Should one issue at a time be taken up and decided as seems expedient?

or

Should all the current issues be considered at one time at one level?

or

Should the study or the policy making process start with a major interest group and main goal and then work down consistently from that level to decisions at the operating policy level?

Each of these methods offers some advantages and some difficulties. The first method is frequently used because it seems to permit quick decisions while avoiding difficult questions on major goals, principles, or complexities. However, it is a piecemeal approach which often leads to inconsistencies, omissions, or duplications of efforts.

The second method--attempting to consider all the issues and alternatives on the same level and at one time--can avoid some of the inconsistencies, omissions and duplications. However, it can be so complicated as to be unworkable. For example, during the early stages of this study an effort was made to diagram most of the main alternatives on public land issues relating to the three factors of utilization, tenure and time. The diagram had 16 utilization categories, 64 tenure categories and sub-classifications, but only two time classes (present and future). It excluded all choices on major interest groups, major goals, other time periods, and whole sub-families of alternatives which had been included. Nevertheless, the diagram contained 2,048 "boxes" each representing a possible decision or course of action! If a third time category had been added, there would have been 3,072 boxes, and the potential number is much larger.

The third method, that of starting with a major interest group and its major goal and following through to policy decisions at the operating level, can be consistent and effective. However, it sometimes is difficult to get agreement as to which major group and which major goal should have priority, and it may be difficult also to maintain a consistent line of reasoning down through the problem solving process. Furthermore, this process must be carried out for a number of major groups and major goals in order to determine bases for national policies.

In view of the foregoing considerations, several approaches were used in this study. The "WHO? WHAT? HOW? WHICH?" sequence was used to put the issues in perspective and to insure that people were considered as well as land and laws.

The following are among the major issues:

Should the federal public lands suitable for intensive agriculture be used:

- To produce food and fiber for national and world needs?
- To aid the economic development of specific regions, States, or communities?
- To settle (occupy) the land?
- To establish proprietorships (or family farm units)?
- To serve (or supplement) another desired use for the land?
- For other reasons? (example: to provide government revenues.)

If the federal public lands suited for intensive agriculture are to be so used, how should this be accomplished:

- With regard to utilization considerations? (which products? types and sizes of units? conservation?)
- With regard to tenure considerations? (ownership? tenancy? administration? operation? restrictions or limitations on tenure?)
- With regard to cost and revenue considerations? (prices? costs and returns to federal government?)
- With regard to time considerations? (for development? for changes in use? for transfers?)
- With regard to other considerations? (administrative classifications? methods of transfer? transfer to States?)

If the federal public lands suited for intensive agriculture are not to be used, how should this be accomplished?

The general procedures used in this study are outlined in the work statement of the contract (see Appendix).

Data for this study were procured from library sources whenever feasible. With the assistance of the Commission's staff, available unpublished data were obtained from relevant government agencies. One of the contractor's staff worked for a period in the Department of the Interior, by arrangement of the Commission, to gather such data.

Some field work and solicitation by mail proved necessary. Another member of the contractor's staff (a soils specialist) secured an inventory of public lands physically suitable for intensive agriculture from field offices of seven agencies in the 17 Western States. Other staff members (agricultural economists) visited the selected sample counties to obtain data.

PART II

THE OPERATION OF THE EXISTING SYSTEM OF AGRICULTURAL ENTRY AND USE OF THE FEDERAL PUBLIC LANDS

A. Disposal of Federal Public Lands for Intensive Agriculture.

B. Administrative Procedures and Disposition Experience of Intensive Agriculture Entries on Public Lands.

C. Permitted Uses of Public Lands for Intensive Agriculture.

As successive waves of development surged westward across our expanding nation, varying patterns of land use, farm organization, and settlement emerged in response to physical, economic, and political conditions. As a result there developed a rather elaborate pattern of laws and procedures relating to settlement and use of federal public lands.

In recent years there has been a growing awareness that these laws and procedures have been failing to accomplish their stated purposes and that they have become costly and cumbersome to administer. In order to evaluate this situation available data were gathered concerning dispositions and permitted use of public lands for intensive agriculture, and case studies were made to identify administrative and procedural problems related to the disposition of these public lands.

It was learned that there are no easy or exact ways to summarize and analyze the experiences with disposition and use of these lands. During most of our nation's history the exact extent of federal land holdings has not been known. Lands have been acquired as well as disposed of, and some have passed into and out of public ownership more than once. In addition to the variations in settlement patterns, uses, laws and procedures mentioned previously, methods and quality of recording and reporting have also varied geographically and over time. Nevertheless, it has been possible to put together summaries usable for policy evaluations although gaps and discrepancies in the data have limited their employment for detailed analyses.

A. DISPOSAL OF FEDERAL PUBLIC LANDS FOR INTENSIVE AGRICULTURE 1934-1966

PUBLIC LAND ACQUISITION AND HOLDINGS IN THE 17 WESTERN STATES

Federal land holdings in the 17 Western States have varied considerably among the States through the years. In 1890 slightly more than half of the total acreage of the whole region was in public ownership. By 1934 the proportion had dropped to about 15 percent, but it had increased somewhat by 1966. At present all lands owned by the federal government, including those designated as public lands, constitute about 32 percent.

In four States federally owned lands still account for more than half of the area (Idaho, 64 percent; Nevada, 87 percent; Oregon, 52 percent; and Utah, 67 percent), and in five additional States more than one-third of the area is in public ownership (Arizona, 45 percent; California, 44 percent; Colorado, 36 percent; New Mexico, 34 percent; and Wyoming, 48 percent). The percentages for the remaining 17 Western States are in Table 1. Public owned acreages listed in Tables 1 and 2 include all types of land, much of it unsuitable for intensive agriculture and not open to homesteading. Originally, no real classifications of lands were attempted. Later some were made, and more recently, various types of surveys and classifications of soils and land uses have been completed or are in process.

SUMMARY OF DISPOSAL ACTS

Homestead Acts

The original Homestead Act, passed in 1862, requires that anyone desiring to enter land must first file an application with the proper land office stating that he or she is head of a family, 21 years of age, and applying for the sole purpose of actual settlement. In addition, the applicant states that he is acquainted with the land and that the land is not saline or mineral. Since the passage of the Taylor Grazing Act of 1934, land must be classified as suitable for agricultural purposes before an application entry can be approved. Classification is the result of pressures for using public lands for purposes other than for agriculture, and until land has been classified it is closed to homestead or desert land entry.

Table 1.--Comparison of federally owned land with total acreage of 17 Western States, 1966

	Acreage of State	Federally owned land	
		Acreage[a]	Percentage
	---------1,000 acres----------		
Arizona	72,688	32,451	45
California	100,207	44,367	44
Colorado	66,486	24,038	36
Idaho	52,933	34,016	64
Kansas	52,511	643	1
Montana	93,271	27,639	30
Nebraska	49,032	724	2
Nevada	70,264	60,971	87
New Mexico	70,264	26,727	34
North Dakota	77,766	2,084	5
Oklahoma	44,452	1,385	3
Oregon	61,599	32,185	52
South Dakota	48,882	3,401	7
Texas	168,218	2,957	2
Utah	52,697	35,181	67
Washington	42,697	12,554	29
Wyoming	62,343	30,004	48
Total 17 Western States	1,160,130	371,325	32
Total 48 contiguous States	1,901,756	406,299	21

Source: U.S. Department of the Interior, Public Land Statistics (Bureau of Land Management, 1967), p. 11.

[a] Includes acreage from all government agencies.

Table 2.--Acres of Federal public land, in 17 Western States and 48 contiguous States for various years.

State	Years			
	1890	1900	1934	1966[a]
	----------------1,000 acres			-----------------
Arizona	49,699	50,287	13,079	12,956
California	53,923	42,468	15,795	15,172
Colorado	39,994	39,650	7,552	8,295
Idaho	46,957	43,287	10,069	12,204
Kansas	756	1,197	---	2
Montana	64,808	67,963	5,879	8,225
Nebraska	11,227	9,799	---	8
Nevada	50,805	61,278	50,976	47,750
New Mexico	56,360	56,541	11,783	13,614
North Dakota	30,497	18,725	142	76
Oklahoma	3,695	5,734	---	18
Oregon	38,273	34,378	12,919	15,673
South Dakota	10,241	11,931	463	278
Texas	---	---	---	---
Utah	36,205	42,967	22,532	22,968
Washington	19,646	11,126	693	275
Wyoming	49,010	48,358	13,813	17,434
Total 17 Western States	562,127	545,688	165,695	174,947
Total 48 States	586,217	557,643	165,695	175,004

Sources: U.S. Department of Commerce, Statistical Abstract of the United States (1936), p. 135; U.S. Department of the Interior, Public Land Statistics, (Bureau of Land Management, 1967), p. 36.

[a] Contains only public land administered by Bureau of Land Management.

If the land is classified as suitable for agricultural purposes and if the application is approved, the entryman has five years to fulfill the requirements for final proof, a prerequisite to obtaining title. The law establishes three general requirements. First, the entryman must construct a habitable house upon the entry. Second, within six months after entering the land, he must establish residence on the land and thereafter, except under certain circumstances, maintain his residence there for at least seven months out of each of the next three years. Third, he must cultivate one-sixteenth of the homestead beginning with the second year of entry and not less than one-eighth each successive year until final proof is filed.

Final proof is completed by filing with the local land office a notice of intention to submit final proof. The notice is then published and the entryman with two witnesses must personally testify as to whether the facts evidence completion of all statutory requirements. After submission of final proof, the entryman is entitled to receive a patent.

Included in the homestead statutes are several acts that changed the scope of the original homestead law. After 1909, enlarged homesteads in nine Western States allowed for entry on 320 acres of non-irrigable, non-mineral lands having no timber while stock raising homesteads allowed for 640 acres of land to be used chiefly for grazing and forage crop production. Another statute allowed the three year period to be greatly shortened or commuted by a cash payment. The Forest Homestead Act, repealed in 1962, opened non-timbered national forests to homesteading after they were classified as agricultural land by the Department of Agriculture.[1]

Desert Land Act

While the Homestead Acts are appropriate for the humid and semi-humid areas of the North and Midwest, much of the West is suitable for farming only under irrigation. Congress, recognizing the difficulties faced in the West, passed the Desert Land Act in 1877. This act initially provided for the sale of 640 acres to a settler who could irrigate part of it within three years. The price per acre was $.25 at time of sale and $1.00 when final proof was made.

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[1] Kronick, Moskovitz, Tiedemann and Girard, "Legal Study of Federal Public Land Laws and Policies Relating to Intensive Agriculture," (Public Land Law Review Commission, 1968), Chaps. 1 and 2, Volume I of this study report.

Because of abuses, Congress in 1891 corrected some of the faults by amending the act. The amendment reduced the number of acres that can be entered from 640 to 320 and stipulates that improvements costing $1.00 an acre must be made during each of the first three years. Furthermore, one-eighth of the total land must be put under cultivation with water available for the entire acreage before a patent is granted.

Obtaining title to land under the Desert Land Act requires several steps generally similar to those for acquiring land under the Homestead Acts. The differences are largely due to desert land requirements for irrigation water. Following is a brief outline of procedures required for obtaining desert land.[2]

1. Applicant determines whether the tract desired is open to application.
2. An application containing a map of the proposed irrigation plan and an approved permit from the State Reclamation Engineer to appropriate ground water (if ground water is to be used) is filed with the Bureau of Land Management, U.S. Department of the Interior.
3. Entry is referred to the Bureau of Land Management for classification, and range users are given 30 days to protest a classification favorable to entry.
4. Applicant must obtain a special land use permit and drill a well to prove adequate ground water is available for irrigation.
5. If all the foregoing are in order, the applicant will receive a notice of allowance, and he can proceed with development which must be completed in less than four years.
6. During the four years the entryman must submit annual reports that show he has spent $1.00 an acre for development. (The reports must be signed by witnesses.)
7. By the end of four years the applicant files his intention to make proof and is ready for patent. The Bureau of Land Management sets a date and proceeds with required advertising.
8. The entryman and witnesses must appear on the appointed day to fill out forms.

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[2] N. D. Kimball, Irrigation Development in Idaho, Idaho Agricultural Experiment Station Bulletin 292 (December 1958), pp. 3-10. For further details, see Kronick and others, Chapter 3 (cited above) Volume I of this study report.

9. The entryman must pay the final purchase price of $1.00 an acre for the land, and if all the foregoing are in order, a patent is granted.

Other Disposal Acts

Shortly after the passage of the Desert Land Act a move for public land cessions to States resulted in the Carey Act of 1894 which provided for a grant of up to a million acres to aid in reclamation in each of the 11 Western States containing desert land. The States were to dispose of the land to settlers in lots not to exceed 160 acres each and to insure that within 10 years not less than 20 acres of each 160 acres were cultivated. The revenue from the disposal of the land was then to be used in the State to develop irrigation for the arid lands. However, because of the high capital requirements and the political boundaries crossed by some rivers, the act did not perform as expected. In fact, eight years after the Carey Act, a mere 11,321 acres had been patented while only 669,476 acres had been approved. At this rate, according to Gates, it would have taken 150 years for the States to develop irrigable public lands.[3]

An effort to speed up development, the Reclamation Act of 1902, pushed the federal government into sponsoring and financing reclamation projects. This act provides that all money from the sale and disposal of public lands in the 17 Western States (except for 5 percent to State of origin) is to be credited to the reclamation fund, a fund that is used for planning, construction, and maintenance of dams and other irrigation works which furnish water to irrigate land.

The Public Land Sale Act of 1964, the most recent law to move lands into private holdings, directs the Secretary of the Interior to sell land classified as agricultural only where zoning laws exist and notice is given that the land is to be sold.[4] However, since no transaction under the Public Sale Act of 1964 occurred between 1934 and 1966, public auction sales to be discussed pertain to other acts. These various other acts allow sale or lease of small tracts, isolated and disconnected fractional tracts, and certain other lands.

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[3] Paul W. Gates, History of Public Land Law Development (Public Land Law Review Commission, 1968), p. 650.

[4] Public Land Law Review Commission, Digest of Public Land Laws (1968), Statute no. 2605.

Included are any vacant, unreserved public lands of five acres or less, valuable for home, business, recreation, or health sites. Isolated tracts up to 1,520 acres may be sold at not less than appraised value. Lands up to 760 acres, too rough for cultivation, may be sold without appraisal even though the tract is not isolated.

The General Exchange Act of 1922 which applies only to forest lands allows tracts of federal land to be exchanged for private land of at least equal value. The purpose is to provide a legal means of simplifying the complex land-ownership pattern since the existence of scattered tracts complicates the administration of federal lands. While the government does not lose lands by exchange, this law has been included here because exchange may involve agricultural lands.[5]

While large quantities of public lands have been disposed of for many different purposes and by various methods under more that 5,000 acts and statutes, the foregoing brief discussion provides some idea of the repeated efforts made by Congress since 1862 to adjust the regulations governing the creation of family farms in the 17 Western States.

PUBLIC LAND DISPOSAL FOR ALL PURPOSES

While this study is concerned with intensive agriculture it is important to note the other uses of public lands. Available data are in the form of summary tables which list the dispositions by types of grants or types of recipients, in rather general terms and for somewhat long time periods. Therefore, it is not feasible to separate out particular uses such as intensive agriculture or to obtain totals by States.

One such tabulation, covering the period 1781-1966, shows a total of 1,041,400,000 acres distributed in the nation. Another summary, covering the period 1781-1934 and admittedly not quite comparable with the first, indicates that 1,017,532,000 acres were disposed of for all purposes. By subtraction, it appears that about 23,868,000 were distributed in the 1934-1966 period (See Table 3). Of this total approximately half (12,175,000 acres) was granted or sold to homesteaders. The remaining land was disposed of by other methods.

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[5] Marion Clawson and Burnell Held, The Federal Lands: Their Use and Management, Resources for the Future, Inc. (Baltimore: Johns Hopkins Press, 1957), pp. 31, 32, 391.

Table 3.--Disposition of public lands, 1781-1934 and 1781-1966, with acreage differences for period 1934-1966

Disposition	1781-1966	1781-1934	1934-1966
Granted or sold to homesteaders	287,300,000	275,125,000	12,175,000
Granted to States for			
support of common schools	77,500,000		
reclamation of swamplands	64,900,000		
support of misc. institutions	21,300,000		
construction of various public improvements	17,800,000		
swamps, educational and other grants		181,680,000	
canals and rivers	6,100,000	6,845,000	
construction of wagon roads	3,400,000	3,359,000	
construction of railroads	37,100,000	38,206,000	
Total granted to States	228,100,000	230,088,000	-1,988,000
Granted to veterans	61,000,000		
Private land claims	34,000,000		
Sold under timber and stone law	13,900,000		
Granted or sold under timber culture law	10,900,000		
Sold under desert land law	10,100,000		
Disposition by methods not elsewhere classified	301,800,000	418,100,000	
Total sold, granted or disposed of by methods not elsewhere classified	431,700,000	418,100,000	13,600,000
Granted to railroad corporations	94,300,000	94,219,000	81,000
Grand total	1,041,400,000	1,017,532,000	23,868,000

Source: U.S. Department of the Interior, Annual Report of the Secretary of the Interior (1934), p. 17; U.S. Department of the Interior, Public Land Statistics (Bureau of Land Management, 1966), p. 6.

Indications of the time of enactment of the major acts, the acreages on which original entries were filed, and the frequent and extreme fluctuations in the filing for claims can be obtained from Figure 1.

Disposal of Public Land By Acts

It is possible to extract useful numerical information concerning past disposals for intensive agriculture since data are available on entries, patents, acres, and costs under various acts, by years, with some exceptions. However, several important qualifications soon become evident. First, it is difficult to be precise because of the lack of information about the capabilities of lands at the time entered upon. Disposals under some of the acts were, by design or otherwise, for grazing and cropping and sometimes for non-agricultural uses. Second, this study treats a period of declining numbers of disposals following a time of major activity. Since most of the homesteading occurred prior to the period 1934-1966 specified for the study, these years are not typical of the overall history of disposals (See Figures 1 and 2). Third, it is not feasible to measure the performance of the disposal processes within these years because of time lags. The procedures for acquiring title require considerable time (anywhere from three to forty years), and earlier first entries reappeared in the period studied as final entries or patents. Likewise, first entries made after 1934 may or may not have progressed to later stages by 1966.

During the period studied (1934-1966) a combined total of 20,505 original entries were made under Homestead Acts and the Desert Land Act in the 17 Western States. There were 46,759 final entries and obviously, most of these represented claims which had been originally entered upon before 1934. Between 1950 and 1966, 18,319 patents were issued, but comparable data are not available for the years from 1934 to 1949 (See Table 4).

The original entries mentioned in the preceding paragraph cover 6,032,357 acres, the final entries, 12,826,102 acres, and the patents, 5,733,059 acres (See Table 5).

If measured by numbers of entries and acreages, more action occurred under Homestead Acts (19 percent) than under the Desert Land Act (14 percent). Public auctions resulted in more final entries (54 percent) covering more acres than the Desert Land Act, and in more patents issued covering more acres than either the Homestead Acts or the Desert Land Act. Exchange of lands resulted in patents only, but

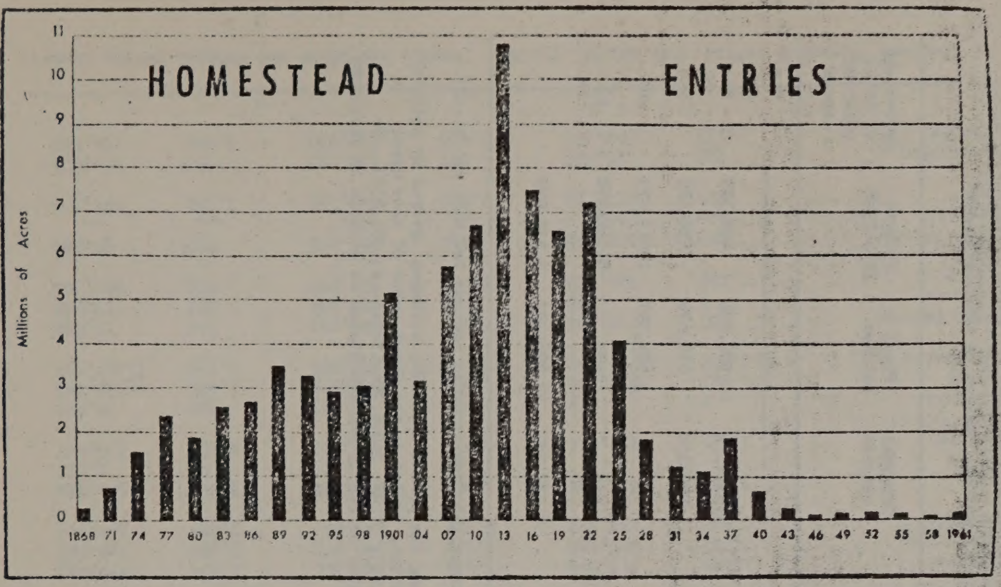
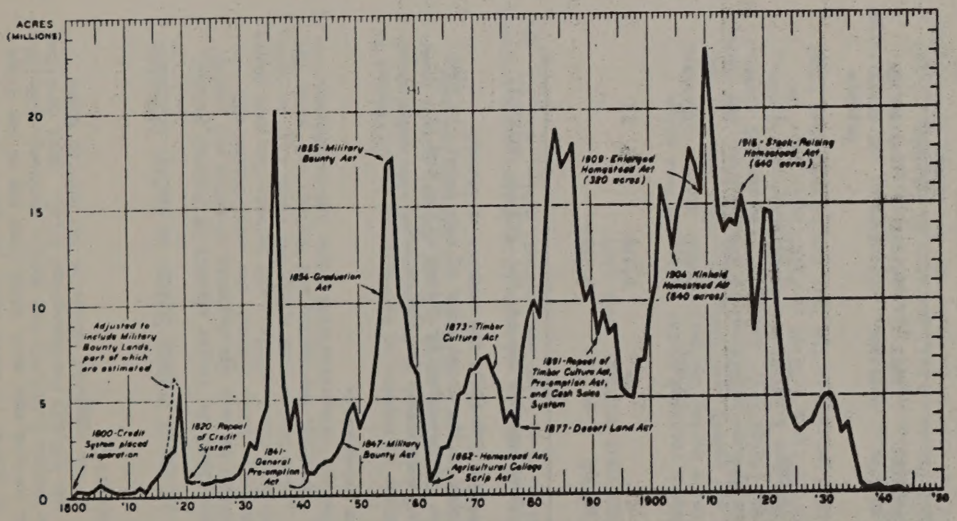


Figure 1

Source: U.S. Department of the Interior, Homesteads, (Bureau of Land Management, 1962).



Bureau of Agricultural Economics, U.S. Department of Agriculture.

Figure 2.--Original Land Entries, 1800-1943

Table 4.--Summary of entries and patents in 17 Western States, by acts, 1934-1966

Acts	Original entries	Final entries	Patents 1950-1966	Percentage of total patents
Homestead Acts	15,040	33,073	3,531	19
Desert Land Act	5,465	3,211	2,553	14
Public auctions	---	10,475	9,817	54
Exchanges	---	---	2,418	13
Total	20,505	46,759	18,319	

Source: Summarized from Appendix tables, Vol. III, pp. 31-183).

Note: During the period 1934-1949, the numbers of patents issued in the nation, listed in the above order of acts were: 33,338; 856; 2,298; 1,342; 37,834. No breakdown by States or for the 17 Western States as a whole is available for the period.

Table 5.--Summary of acreages covered by entries and patents in 17 Western States, by acts, 1934-1966

Acts	Original entries	Final entries	Patents 1950-1966	Percentage of total patented acres
	--------------acres------------------			
Homestead Acts	4,932,199	10,590,826	438,123	8
Desert Land Act	1,100,158	610,679	530,185	9
Public auctions	---	1,624,597	1,613,473	28
Exchanges	---	---	3,151,278	55
Total	6,032,357	12,826,102	5,733,059	

Source: Summarized from Appendix tables, Vol.III, pp. 31-183.

Note: During the period 1934-1949 acreages covered by patents issued in the nation, listed in the above order of acts were: 11,134,458; 113,853; 2,298; 2,096,266 (total--13,571,132). No breakdown by States or for 17 Western States as a whole is available for the period.

these were almost equal in number to those under the Desert Land Act (2,418 versus 2,553) and covered many more acres than any of the other devices (3,151,278 acres versus 1,613,473 for public auctions, 530,185 for the Desert Land Act and 438,123 for Homestead Acts). More detailed information is supplied in the appendix tables to the working paper under this title in Volume III.

Disposal of Public Land in the 17 Western States, by States, 1934-1966

The States which contained the larger amounts of federal public lands quite naturally tended to have the majority of entry and patent activities during the period. Table 6 shows the total number and acreages of original entries, final entries, and patents for each State while Table 7 indicates which States rank among the first five in each of the same categories. Wyoming, New Mexico and Montana are among the first five in five of the six categories with Idaho and California similarly ranked in four categories.

Some of the variations in numbers or acreages can be attributed to differences in periods of settlement or in choices of acts under which the lands were disposed. Texas has never had any Federal public lands. Kansas had no original entries while Oklahoma and Nebraska had only four and five respectively.

More details concerning entries and patents by States under various acts are provided in Tables 8-13 (also see appendix tables, Vol. III pp. 31-183).

REVENUE FROM DISPOSAL, 1934-1966

The federal government received monies either as fees or as receipts from auction sales during the period under study. Homestead fees produced $835,930 and desert land fees, $955,664. However, the receipts from auction sales were much greater, $14,609,869. The overall total was $16,401,390 (Table 14). Returns to the federal government per acre of land averaged $.12 for homestead lands, $1.32 for desert lands, and $8.99 for lands sold at auction (Table 15). No monies were collected from patents as the last fee is paid when final proof is filed.

For individual States, homestead original and final entries returned approximately the same price per acre. Homestead original entries varied from $.05 in South Dakota to $.13 per acre in Nebraska. Final entries ranged from $.03 an acre in Nebraska and New Mexico to $.11 an acre in Montana (Tables 8 and 10).

Table 6.--Summary of entries and patents under all acts for 17 Western States, 1934-1966 (except patents, 1950-1966 only), by States

State	Original entries		Final entries		Patents	
	Number	Acres	Number	Acres	Number	Acres
Arizona	1,164	315,044	3,455	1,000,666	1,194	654,015
California	2,081	389,720	5,139	943,073	2,367	459,268
Colorado	1,130	255,522	4,216	933,467	1,859	354,908
Idaho	3,475	828,739	3,365	922,278	3,248	546,922
Kansas	---	---	32	1,395	24	1,122
Montana	1,476	490,610	6,325	412,988	2,189	536,427
Nebraska	5	414	393	36,983	396	34,002
Nevada	1,573	388,388	1,213	2,808,679	1,090	535,291
New Mexico	2,864	1,218,940	7,047	2,860,900	1,235	1,167,539
North Dakota	187	33,204	431	47,733	216	19,609
Oklahoma	4	376	528	19,434	235	13,728
Oregon	2,018	254,267	2,668	527,738	865	461,361
South Dakota	273	102,116	842	184,439	350	56,384
Texas *	---	---	---	---	---	---
Utah	917	277,781	1,980	647,153	1,281	498,534
Washington	219	28,628	621	113,723	370	109,201
Wyoming	3,119	1,348,508	7,405	2,920,285	1,422	254,480

Source: Appendix tables, Vol. III, pp. 31-183. (*Texas has never had Federal public lands).

Table 7.--Ranking of States among the first five in at least one of six entry and patent categories

State	Original entries		Final entries		Patents	
	Number	Acreage	Number	Acreage	Number	Acreage
Arizona	8	7	6	5	8	2
California	4	5	4	6	2	8
Colorado	9	9	5	7	4	9
Idaho	1	3	7	8	1	3
Montana	7	4	3	4	3	4
Nevada	6	6	10	3	9	5
New Mexico	3	2	2	2	7	1
Oregon	5	10	8	10	10	7
Wyoming	2	1	1	1	5	10

Source: Table 6.

Note: States which did not rank in first five in any category: Kansas, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, Utah, Washington.

Table 8.--Summary of original entries and selections allowed under Homestead Acts in 17 Western States, 1934-1966

	Number	Acres	Monies[a]	Cost per acre
Arizona	908	258, 346	$ 18, 296	$0. 07
California	1, 373	247, 868	21, 946	. 09
Colorado	1, 109	352, 002	23, 684	. 07
Idaho	1, 599	389, 371	30, 621	. 08
Kansas	---	---	---	---
Montana	1, 468	489, 156	33, 610	. 07
Nebraska	5	414	55	. 13
Nevada	303	51, 992	4, 834	. 09
New Mexico	2, 755	1, 195, 486	74, 306	. 06
North Dakota	187	33, 204	2, 573	. 08
Oklahoma	4	376	40	. 11
Oregon	1, 186	230, 136	18, 749	. 08
South Dakota	273	102, 116	4, 988	. 05
Texas	---	---	---	---
Utah	735	240. 272	16. 637	. 07
Washington	215	27, 990	3, 380	. 12
Wyoming	2, 920	1. 313, 470	91, 522	. 07
Total	15. 040	4, 932. 199	$345, 241	$0. 07

Sources: Appendix A tables, Vol. III, pp. 31-57.

[a] Monies include fees and commissions.

Table 9.--Summary of original entries and selections allowed under Desert Land Act in 17 Western States, 1934-1966

	Number	Acres	Monies[a]	Cost per acre
Arizona	256	56, 698	$ 14, 194	$0. 25
California	708	141, 852	35, 214	. 25
Colorado	21	3, 520	898	. 25
Idaho	1, 876	439, 468	144, 813	. 33
Kansas	---	---	---	---
Montana	8	1, 454	380	. 26
Nebraska	---	---	---	---
Nevada	1, 270	336, 396	95, 087	. 28
New Mexico	109	23, 454	6, 518	. 28
North Dakota	---	---	---	---
Oklahoma	---	---	---	---
Oregon	832	24, 131	6, 299	. 26
South Dakota	---	---	---	---
Texas	---	---	---	---
Utah	182	37, 509	8, 384	. 22
Washington	4	638	219	. 29
Wyoming	199	35, 038	8, 970	. 26
Total	5, 465	1, 100, 158	$320, 976	$0. 29

Sources: Appendix B tables, Vol. III, pp. 59-79.

[a] Monies include fees, commissions and purchase money.

Table 10.--Summary of final entries under Homestead Acts in 17 Western States, 1934-1966

	Number	Acres	Monies	Cost per acre
Arizona	2, 684	859, 127	$ 34, 379	$0. 04
California	3, 119	664, 012	35, 078	. 05
Colorado	2, 578	729, 346	32, 193	. 04
Idaho	2, 309	562, 634	24, 774	. 04
Kansas	---	---	---	---
Montana	4, 747	1, 168, 294	125, 979	. 11
Nebraska	215	22, 184	569	. 03
Nevada	335	69, 639	3, 089	. 04
New Mexico	6. 147	2, 622. 471	68, 385	. 03
North Dakota	295	39, 118	1, 502	. 04
Oklahoma	14	1, 030	43	. 04
Oregon	2, 122	415, 820	20, 927	. 05
South Dakota	568	146, 188	5, 385	. 04
Texas	---	---	---	---
Utah	1, 208	487, 589	18, 053	. 04
Washington	277	39, 240	3, 450	. 09
Wyoming	6, 455	2, 764, 134	116, 883	. 04
Total	33. 073	10, 590, 826	$490, 689	$0. 05

Sources: Appendix C tables, Vol. III, pp. 81-110.

[a] Monies include fees and commissions.

Table 11. --Summary of final entries under Desert Land Act in 17 Western States, 1934-1966

	Number	Acres	Monies[a]	Cost per acre
Arizona	236	47, 034	$ 73, 783	$1. 57
California	443	63, 553	68, 144	1. 07
Colorado	51	8, 930	7, 276	. 81
Idaho	1, 196	244, 379	238, 239	. 97
Kansas	---	---	---	---
Montana	124	16, 997	17, 102	1. 01
Nebraska	---	---	---	---
Nevada	521	130, 952	131, 534	1. 00
New Mexico	75	12, 027	11, 684	. 97
North Dakota	---	---	---	---
Oklahoma	---	---	---	---
Oregon	164	17, 568	17, 535	1. 00
South Dakota	1	76	76	1. 00
Texas	---	---	---	---
Utah	137	22, 502	22, 557	1. 00
Washington	20	1, 525	1, 582	1. 04
Wyoming	243	45, 136	45, 176	1. 00
Total	3. 211	610, 679	$634, 688	$1. 03

Sources: Appendix D tables, Vol. III, pp. 111-134.

[a] Monies include fees. commissions and purchase money.

Table 12. --Summary of final entries under public auction sales in 17 Western States, 1934-1966

	Number	Acres	Monies[a]	Cost per acre
Arizona	535	94, 508	$ 1, 358, 020	$14. 37
California	1, 577	215, 508	3, 052, 528	14, 16
Colorado	1, 587	195, 191	1, 414, 696	7. 25
Idaho	960	115, 265	1, 115, 084	9. 67
Kansas	32	1, 395	10, 844	7. 77
Montana	1, 454	227, 697	1, 238, 379	5. 44
Nebraska	178	14, 799	90, 918	6. 14
Nevada	357	55, 256	1, 052, 311	19. 04
New Mexico	824	226, 402	1, 977, 984	8. 74
North Dakota	136	8, 615	53, 054	6. 16
Oklahoma	514	18, 404	343, 080	1. 86
Oregon	382	92, 350	652, 821	7. 07
South Dakota	273	38, 175	194, 263	5. 09
Texas	---	---	---	---
Utah	635	137, 062	652. 706	4. 76
Washington	324	72, 958	487, 077	6. 68
Wyoming	707	111, 015	916, 131	8. 25
Total	10. 475	1, 624, 597	$14, 609, 896	$8. 99

Sources: Appendix E tables, Vol. III,pp. 135-165.

[a] Monies include fees. commissions and purchase money.

Table 13.--Summary of patents in 17 Western States by acts, 1950-1966

	Homestead Acts		Desert Land Act		Public auction[a]		Exchange	
	Number	Acres	Number	Acres	Number	Acres	Number	Acres
Arizona	130	17,649	157	38,704	549	99,344	358	498,318
California	279	30,268	336	53,390	1,509	211,157	243	194,721
Colorado	149	23,219	20	3,540	1,533	192,365	157	135,784
Idaho	886	114,927	1,093	227,394	949	117,162	310	87,439
Kansas	---	---	---	---	24	1,122	---	---
Montana	717	68,867	9	1,616	1,336	198,545	127	267,399
Nebraska	139	13,848	---	---	257	19,874	---	280
Nevada	132	16,914	512	132,725	215	50,705	231	334,947
New Mexico	191	11,577	71	11,470	807	238,863	166	905,629
North Dakota	31	3,303	---	---	169	12,420	16	3,886
Oklahoma	6	688	---	---	229	13,040	---	---
Oregon	67	5,476	68	8,735	368	92,807	362	354,343
South Dakota	64	8,513	---	---	263	44,835	23	3,036
Texas	---	---	---	---	---	---	---	---
Utah	213	53,037	100	17,553	670	139,658	298	288,286
Washington	59	5,727	1	330	293	79,797	17	23,347
Wyoming	468	64,110	198	34,728	646	101,779	110	53,863
Total (1950-1966)	3,531	438,123	2,553	530,185	9,817	1,613,473	2,418	3,151,278

Sources: Appendix F tables, Vol.III, pp. 167-183.

[a] No entries were made until 1967 under Public Sales Act of 1964

Table 14.--Summary of monies collected for original and final entries in 17 Western States, by acts, 1934-1966

Acts	Total monies received			Percentage of total monies
	Original entries	Final entries	Totals	
Homestead Acts	$345,241	$ 490,689	$ 835,930	5
Desert Land Act	320,976	634,688	955,664	6
Public auctions	---	---	14,609,896	89
Exchanges	---	---	---	--
Totals	$666,217	$1,125,377	$16,401,390	

Source: Tables 8-12.

Table 15.--Summary of costs (fees, commissions, and purchase money) per acre for original and final entries in 17 Western States, by acts, 1934-1966

Acts	Average Cost per acre Original entry	 Final entry	 Total
Homestead Acts	$.07	$ .05	$ .12
Desert Land Act	.29	1.03	1.32
Public auctions	---	---	8.99
Exchanges	---	---	---

Source: Tables 8-12.

Desert land fees varied only a little among the States. Original entries ranged from $.22 an acre in Utah to $.33 an acre in Idaho, and final entries varied from $.81 an acre in Colorado to $1.57 an acre in Arizona (Tables 9 and 11).

The greatest revenue variation among States occurred in sales by public auction. Nevada sales averaged $19.04 an acre while Oklahoma averaged $1.86 an acre. Of course, it can be assumed that these prices reflect to some degree the variations in capabilities of land, but it is obvious that the federal government has received more gross dollar revenue per acre from land auctions than from other methods of disposition. However, a thorough analysis of these revenue differences requires information not obtained in this study. Such information necessarily would include the relative capabilities of the lands, the direct costs of disposition under the various acts, and the monetary and nonmonetary indirect benefits and costs associated with the dispositions. However, even when measured in gross dollar receipts, the direct returns to the federal government have been relatively small.

ENTRIES AND PATENTS DENIED

Denials of entries and patents provide indications of difficulties and problems which confront entrymen and administrators and are an important aspect of this study. Although the intent of the study was to explore these in depth, the information needed for valid conclusions was not available, and therefore, only a limited exploration was possible.

The Bureau of Land Management has done some research on denials, and its study of the years 1950-1959 in 11 Western States showed that an applicant had only a small chance of gaining entry. Approximately 25,000 applications, including those under the now repealed Pittman Act were filed with the following results:

Acts	Allowed (percent)	Denied (percent)
Homestead	14	86
Desert Land	17	83

Chances of having an application allowed varied from State to State. Nevada and Utah had 57 percent of homestead entries allowed, while 67 percent of desert land entries were in Idaho and Nevada.

Lack of data prevented similar calculations for the years 1934-1966. While the number of original entries allowed is known, there is no information on the number filed. Thus the number of original entries denied during the study period is unavailable.

After an individual is allowed an original entry, what are his chances of carrying it to a patent? The Bureau of Land Management study indicates that the chances of obtaining a patent are only 50-50 under the Homestead Acts and the Desert Land Act--after a 14 percent chance of first obtaining a homestead original entry.[6]

The same study provides data sufficient for drawing some conclusions related to final entry--the initial step before a patent. If a final entry is approved, a patent is almost assured. Original homestead entries from 1863 to 1935 totaled 3,023,728 with 15,040 allowed between 1934 and 1966 (Table 4).[7] Total original entries from 1863 to 1966 were 3,038,768 with two years included twice because of the method of reporting. Final homestead entries approved from 1863 to 1935 totaled 1,744,818 and an additional 33,073 final homestead entries were approved from 1934-1966 (Table 4).[8] Total final homestead entries from 1863 to 1966 with two years (1935, 1936) being counted twice were 1,777,891.

Once the two sums are known, subtraction shows that 1,260,877 original homestead entries had not been given final approval as of 1966. A total of 1,627 homestead entries (original and final) were still pending in 1966 and subtracting these shows that 1,259,250 were never given final entry.[9] The exact nature of these entries that did not make final proof is unknown. Certainly some were denied and some were dropped before final entry. However, this total of 1,259,250 represents 41 percent of those that were allowed original entry and corresponds to the previously cited Bureau of Land Management study which indicated that only 50 percent of the original entries in the 11 Western States were carried to a patent.

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[6] Irving Senzel, "New Facts About Our Agricultural Land Laws," reprinted from Our Public Lands, quarterly magazine of the Bureau of Land Management, U.S. Department of the Interior.

[7] Data on original homestead entries 1863-1935, from Eugene Hughes (letter, 6 January 1969).

[8] Data on final homestead entries, 1863-1935 from U.S. Department of the Interior, Public Land Statistics (Bureau of Land Management, 1964), p. 56.

[9] U.S. Department of the Interior, Public Land Statistics (Bureau of Land Management, 1966), p. 62.

Additional and more specific examples of the chances of obtaining title are presented in "Administrative Procedures and Disposition Experiences" in this report. The cases studied illustrate the problems of obtaining administrative approval of entries. Equally important, these cases illuminate the personal and developmental difficulties which cause settlers to fail to meet the requirements for original or final entries.

SUMMARY AND CONCLUSIONS

During the 33 years, 1934 - 1966, 18,319 individuals obtained title to 5,733,059 acres of public land, a large amount of land which is relatively small when compared with the total acreage of public lands in the 17 Western States (175,000,000). However, it is somewhat more significant when compared with the area suitable for intensive agriculture and open to disposal. The quantity of public land suited for dryland and irrigated crop production is estimated to be 1,600,000 acres.

The foregoing seems to indicate that good unused lands in the West are scarce and that the laws requiring classification may have further decreased the acreage of relatively good lands available for intensive agriculture. With the pressures of growing cities, recreation, and industry it seems reasonable that some areas suited for intensive agriculture have been diverted for these other purposes.

The laws and regulations seem to have made it extremely difficult to obtain title to public lands. The Bureau of Land Management study of original entries under the Homestead Acts and Desert Land Act indicates that only 14 and 17 percent respectively passed to final proof and that the chances of obtaining a patent were only 50-50, with chances continuing to lessen.

Under the homestead and desert land laws, relatively little revenue was returned to the federal government during the 1934-1966 period. Although this point was not studied, it seems questionable that this small amount of income could have covered administrative costs. However, if the objective was to establish farm units and settle the area, the costs may have been justified. Sales by public auction brought the most return with an average of $8.99 per acre.

B. ADMINISTRATIVE PROCEDURES AND DISPOSITION EXPERIENCE OF INTENSIVE AGRICULTURE ENTRIES ON PUBLIC LANDS

ADMINISTRATIVE PROCEDURES

INTRODUCTION

The Problem: Do the Public Land Laws Provide an Efficient Procedure for the Transfer of Public Land to Private Ownership for Intensive Agriculture?

In recent years there has been a growing awareness among administrators of public land laws and other informed persons that these laws are failing to attain their intended objectives and that they are extremely cumbersome to administer. Writing in 1963 about the Homestead, Desert Land and Pittman Acts, Dr. Irving Senzel, Chief, Division of Lands and Recreation, Bureau of Land Management declared: "These land laws were written to encourage the agricultural development of vast areas of the West and especially with the Homestead Act of 1862, they once served admirable purposes. Now however, there are many reasons to believe the laws are obsolete. Research in the public land law field has been long neglected. As a result, much of what is generally 'known' about them is more myth than fact. Employees of the Bureau of Land Management working with these laws are acutely aware that they are not operating in the manner popularly assumed."[1]

One aspect of concern to both administrators and applicants has been the long interval between the time of application and final disposition--whether, by rejection, cancellation, relinquishment, or the issuance of a patent. Once entry has been granted, there are

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[1] Irving Senzel, "New Facts About Our Agricultural Land Laws," reprint from Our Public Lands, quarterly magazine of the Bureau of Land Management, U.S. Department of the Interior.

disposition--whether by rejection, cancellation, relinquishment or, hopefully, the issuance of a patent. Once entry has been granted, there are definite time and other requirements which become applicable to the claimant. If the applicant is diligent in fulfilling his obligations and if the administrators act promptly whenever administrative action is necessary, then it is possible to conclude a case successfully within the time probably envisioned by the authors of the laws and regulations. However, in actual practice many reasons for delay develop at different stages in the process of earning a patent. Each claim has its own characteristics, and is therefore apt to develop problems applicable only to itself. This feature creates serious administrative problems since it limits the possibilities for standardizing procedures, including the decision making process for administrators. In short, cases are very individualistic and therein lies a major cause for the high administrative cost and the frequent and often long delays.

The Current Study--Purpose and Scope

The current study had among its objectives the review of available literature and the documentation and analysis of data from case files of the Bureau of Land Management to show the recent operation and administration of present disposal laws, regulations and agency practices as related to intensive agriculture entries. Case files were randomly selected to be broadly representative of original and final entries and patents granted since 1950 under each major authority: the Homestead, the Desert Land and the Reclamation Homestead Acts.

Homestead Act cases were classified into the two categories recognized by law, (1) ordinary and (2) enlarged types. Reclamation homestead entries were separated also into two groups, (1) regular and (2) those involving "in lieu" units. This was done because of the rather marked differences in requirements and records relating to each type. For "in lieu" units the files tend not to include the detailed records pertaining to the original units, that is, records of actions taken after filing of application for the units relinquished or exchanged. For this reason the total time lapse and the interval between actions are quite different for "in lieu" cases than for regular reclamation claims. Additional details on procedures used in the study, including selection of case files, are included in the Appendix, Vol. III.

LAND APPLICATIONS--WHAT HAPPENS TO THEM?

There is much evidence in the records of the Bureau of Land Management to show the very slim chance that an applicant has of obtaining ownership or even permission to enter the land to attempt to earn a patent. Preliminary results of an effectiveness study by the Bureau of Land Management of 25,000 applications received in the 1950-1959 period in 11 Western States reveal some startling facts about the possibility of having an application approved for entry. According to the study, the chances are small and getting smaller all the time as the following figures show:[2]

Type of application	Percentage allowed	Percentage denied
Homestead	14	86
Desert Land	17	83
Pittman Act	11	89

This information indicates that applicants under the Homestead and Desert Land Acts have roughly one chance out of six or seven of gaining entry for the purpose of earning a patent. The Pittman Act, applicable only to Nevada, has been repealed.

If entry were allowed, what about the chance of getting a patent? The same study did not give an encouraging answer. In fact, for the homestead and desert land applicants who gained entry in the 11 Western States, the chance of receiving a patent was quoted as only 50-50.

ADMINISTRATIVE ACTIONS

Kinds of Actions

The homestead laws and regulations specify certain mandatory actions which must be initiated by the claimant or the administrators. The sequence and time factor are also specified or implied. In addition, there are other actions that become applicable in some instances depending upon special circumstances peculiar to a particular application. For discussion purposes the actions are classed in two categories: (1) regular, which are basic in all cases; and (2) supplementary, which are applicable only in certain circumstances. The major actions identified as regular are shown in the chronological order of implementation.

Regular actions:

1. Application, preparation and submission (by claimant)
2. Entry, allowed or disapproved (by administrator)

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[2] Senzel, "New Facts."

3. Establishment of residence (if required of claimant)
4. Intentions to make proof (filed by claimant)
5. Notice for publication of intentions to make proof (by administrator)
6. Affidavit of publication of intentions to make proof (by publisher)
7. Submission of annual, final and supplemental reclamation proof as required (by eutryman)
8. Certificate of compliance (by administrator)
9. Issuance of patent (by administrator)

Supplementary actions:

1. Geological survey reports on mineral, gas and water reserves
2. Time extensions
3. Suspensions and rejections of application, entry or proof
4. Assignments
5. Amendment of entry
6. Mineral waiver
7. Appeal
8. Cancellation of entry
9. Other, including legal disputes over water rights, leases and similar matters

This long list of actions referred to as "regular" and "supplementary" tends to stress the large number of opportunities for problems and delays to develop during the processing procedure. These actions are closely related to the high administrative costs, delays in processing applications, and the long time lapse from date of application to final disposition by rejection, cancellation of entry, relinquishment, or the issuance of a patent.

Frequency of Implementation of Various Actions

Supplementary actions are a primary concern, for they are the ones that tend to become pertinent when the claimant or the administrator encounters a serious problem.

How often are these supplementary actions invoked? Quite often—when they are considered collectively. Very few applications, especially after entry has been allowed, escape involvement in one or more of the supplementary actions mentioned. A study of case histories by type of application revealed how often these actions take place:

Homestead Entries, Ordinary and Enlarged

For this category, 19 entries which earned patents were examined--12 ordinary and 7 of the enlarged type. For 18 of the 19 entries the Bureau of Land Management requested the Geological Survey to report on mineral, gas and water reserves. The total of such requests numbered 32 since more than one request was made for some entries. Subsequently 11 of the 19 were required to furnish a total of 14 waivers.

During the process, 10 of the 19 experienced rejection or suspension of the application or entry a total of 13 times, and four had the final proof rejected or suspended; two were amended; five made six requests for time extensions; two were involved in legal actions; and two made appeals from administrative decisions.

In another group of 11 entries that were ultimately cancelled seven had the application or entry rejected or suspended; one was amended; four had five proofs rejected or suspended; five each requested one time extension; and five became involved in seven appeals.

Desert Land Entries

Of 24 entries reaching patent, 15 were required to furnish mineral waivers (some more than one) for a total of 20, and 13 experienced 20 rejections or suspensions of the application or entry; five had the proof rejected or suspended at least once; eight requested 15 time extensions; two initiated appeals from administrative decisions; five were involved in seven instances of assignments; and four entries were amended.

For 11 cancelled entries the situation was quite similar to that for entries gaining patent: three were required to furnish mineral waivers; five experienced nine rejections or suspensions of application or entry; two had proof rejected; six requested 15 time extensions; one appealed an administrative decision; and four had assignments recognized.

Reclamation Homestead Entries

The most common action, as was the case for other types, involved requests for reports from the Geological Survey. Out of 26 entries 23 made 39 requests to Geological Survey for information on mineral, gas and water reserves; five entries were amended; four went through assignment procedure; four requested a total of six time extensions; two made appeals from administrative decisions; six were required to file special affidavits of compliance; three were suspended but later reinstated.

COSTS OF ADMINISTRATION

Size of the Administrative Work Load

A rough measure of the magnitude of the administrative work load entailed in processing Homestead and Desert Land Act applications was obtained through a count of documents in application files.[3] The count was made in the order the files were received and tabulated for the study; that is, there was no preselection. The document count, summarized in Table 1, indicates an average of more than 50 documents per file and well over 100 for some files. The minimum number noted for entries going to patent was 33, the maximum 207.

Even after allowing for some duplication of documents, it seems apparent that the paper work becomes staggering when viewed in terms of total applications that have been, or are being, processed. Each document is related to a specific action and represents an unknown amount of time expended by employees of the Bureau of Land Management, claimant, witnesses, legal authorities, personnel of other governmental agencies and other persons. It is possible only to conjecture as to the total man hours and related costs incurred by those involved, but it appears obvious that the total cost is high even though the time spent per document was as little as one hour.

References to the scope of the total effort expended in processing claims are found in a study of desert land applications and investigations by the Economic Research Service of the United States Department of Agriculture.

The report states: "In the period beginning in 1950 and ending in late 1962, about 20,000 applications were made under the Desert Land Act. In the years 1950-1961, field investigations were made for 15,877 new cases. In the same years, adjudication operations covered 22,086 new cases and 9,226 reactivated cases, a total of 31,312. Of these cases, 29,949 were closed by one action or another. These numbers suggest the vast volume of work involved for limited staffs in a few offices, since the activity occurred mostly in a few states.

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[3] Bureau of Land Management, Application Case Files, U.S. Department of the Interior (Washington, D.C.). The count consists of official forms such as the applications, intentions to make proof, receipts, notices, and unstandardized items like letters, legal decisions, permits and waivers.

"Land classifications were made for 11,886 tracts during 1950-1961; 4,346 were classed as suitable and 7,540 as unsuitable. In the 16 years 1946-1961, more than 3,000,000 acres were classified; about a third was classed as suitable for irrigation development. Of course, many applications are rejected and closed without reaching the classification state."[4]

Table 1.--Number of documents per application for land under the Homestead Acts and the Desert Land Act

Type of application	No. of cases	Documents per file		
		Average	Minimum	Maximum
Patent issued				
Homestead, ordinary	6	54	33	85
Homestead, enlarged	5	48	36	66
Desert land	8	82	44	207
Application cancelled or relinquished				
Homestead, ordinary	10	52	9	96
Homestead, enlarged	2	76	18	133
Desert land	11	56	15	124
All cases	35	61[a]	26[a]	118[a]

Source: Bureau of Land Management, Application Case Files, U.S. Department of the Interior (Washington, D.C.).

[a] unweighted average

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[4] Clyde E. Stewart, The Desert Land Act in Mid-Twentieth Century: Issues and Problems, U.S. Department of Agriculture, Economic Research Service, ERS-151 (1964), p.6.

All of the foregoing facts indicating the volume of work and implied costs of processing applications tend to support strongly the expressions of concern about whether the various authorities as now constituted provide a realistic means of transferring land to private ownership for intensive agriculture. A valid conclusion appears to be that they do not.

Administrative Cost Per Patented Acre

Through its effectiveness study, the Bureau of Land Management indicated its concern over the cost factor.[5] In a report on its preliminary findings the Bureau stated:

"How about the costs of handling all this business--much of which seems doomed to failure from the start? That's a facet of the study that is waiting more detailed analysis when all the facts are in. But because the Pittman Act (now repealed) has apparently reached its final stages, a rough estimate based on applications made during the study period has been made for patenting lands under this act.

The estimates of the Pittman Act costs, hobbled with restraints to underestimate rather than to overestimate, concluded that only a very small acreage will be patented under the act and that it will cost Uncle Sam well over $100 per acre for each acre patented. The total costs including the expenditures by State and local governments and the applicants themselves (both successful and unsuccessful) will amount to more than $200 per acre patented."

Later in 1963 as more complete results of the study became available, the Bureau developed indications of the cost of transferring lands to private ownership under the Homestead and Desert Land Acts. An assumption was made by the Bureau that the costs per application were $300, a modest estimate, which includes costs assumed by the federal government, the State and the applicant. The indicated administrative cost per acre patented by November 1, 1962, from 1950-1959 applications for 11 Western States is shown in Table 2.

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[5] Bureau of Land Management, Phase I of Agriculture Land Laws Effectiveness Study, U.S. Department of the Interior (Washington, D.C., 1960).

Table 2.--Indicated administrative costs for acres patented from 1950-1959 homestead and desert land applications

State	Acres patented	Indicated cost	
		Total	Per acre patented
Arizona	27,087	$ 567,900	$ 21
California	16,525	2,756,700	165
Colorado	8,219	152,700	19
Idaho	134,134	900,900	7
Montana	1,242	42,300	34
Nevada	46,308	1,928,400	42
New Mexico	9,465	418,200	44
Oregon	7,414	109,200	15
Utah	25,206	360,600	14
Washington	803	15,300	19
Wyoming	21,084	116,700	6

These data in the aggregate indicate an average administrative cost of $26 per acre patented. When translated to the cost of a patented homestead (ordinary) unit of 160 acres, such a unit has a built-in average administrative cost of $4160. For a Desert Land Act homestead of 320 acres the indicated cost soars to $8320, not counting the cost of improvements made by the claimant.

TIME INTERVALS BETWEEN SPECIFIED ACTIONS

One purpose of the current study was to develop information on the time lag between actions in processing applications. Only fragmentary bits of published information could be found on this subject. A study of the administration of the Desert Land Act for Utah was the basis of the following comments by the Economic Research Service.

"The Utah study provided considerable information on the problem of long lags between the various steps in processing desert land applications. The study revealed that applicants had often been slow to complete their investigations because of lack of capital, distance between their residence and the land applied for, and numerous other factors. The Bureau of Land Management had been slowed down, especially in periods of high activity, by lack of sufficient personnel to process actions promptly. . . . Delays in the investigative reports from Geological Survey, failure of applicant to supply necessary information, lack of data about the land and water resources, exercise of the right of appeal, and filing by more than one applicant for the same tract are all factors that may contribute to long delays."[6]

This current study of administrative procedures substantiates the fact that frequent delays often combine to extend the processing period to an unrealistic length. The requirements upon the claimant differ among authorities, and therefore, it is impractical to compare the time intervals between actions after entry for the various acts. However, valid comparisons can be made of time periods between dates of application and approval for entry and also of the intervals between application and patent.

For cases within the study, the pre-entry wait was shortest for Reclamation Act applicants, an average of one month. Some were granted entry on the day of application, while the longest wait was seven months.

Claimants under the Homestead Act waited an average of 16 months to gain entry to ordinary type units and 17 months for enlarged tracts. The minimum time for the ordinary homestead was one month compared with four months for the enlarged type. The maximum times were 39 and 69 months, respectively.

Applicants for desert land tracts had the longest average wait to gain entry--25 months. The minimum time was five months with the longest delay 95 months--nearly eight years.

The details on time intervals for the Homestead (ordinary and enlarged) and Desert Land Act applications may be noted in Table 3. From the data an idea can be developed of the rate of progress that the average claimant might anticipate in developing a claim. The time schedule would be in the following order, depending on the type of claim.

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[6] C. E. Stewart, Recent Land and Ground Water Development in Utah under the Desert Land Act--an Economic Appraisal, Utah Agricultural Experiment Station Bulletin 418 (1960), p. 36.

The claimant under the Homestead (ordinary) Act may expect to establish residence in about five months after entry is allowed, to file intentions to make proof 39 months later, to make final proof three months subsequent, and eight months later to have compliance certified. The patent follows in about one month. Total lapsed time after entry--53 months.

In the case of an enlarged homestead, the applicant with approved entry can expect to file intentions to make proof in 62 months, to file final proof two months later, and to obtain a certificate of compliance in an additional four months followed by a patent in one month--total average time after entry, 69 months.

Table 3.--Time interval between successive specified major actions after application and issuance of the patent for homestead and desert land entries

Action	Homestead								
	Ordinary[a]			Enlarged[b]			Desert land[c]		
	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.
	---------------Time interval in months---------------								
Entry allowed	16	1	39	17	4	69	25	5	95
Residence established	5	0	12	--	--	--	--	--	--
Proof, intentions to make	39	7	59	62	23	81	54	12	111
Proof, final filed by claimant	3	2	8	2	2	4	3	1	10
Certificate of compliance issued	8	1	25	4	1	10	6	0	48
Patent issued	1	1	3	1	1	2	1	0	2

Source: Bureau of Land Management, Application Case Files, U.S. Department of the Interior, Washington, D.C.

[a] 12 cases. [b] 7 cases. [c] 24 cases.

The experience of reclamation applicants was so varied that it is difficult to generalize. For claims not involving exchange or "in lieu" units, the longest interval after entry was prior to filing intentions to make proof--similar to the pattern under the other acts; but in addition, there was usually a long lapse in developing the required supplemental reclamation proof.

THE TOTAL TIME LAPSE--APPLICATION TO PATENT

For the cases studied, the total time lapse (Table 4) ranged from an average low of 72 months (six years) for the homestead, ordinary claim, to 174 months (14 1/2 years) for reclamation, regular cases. The high average time lapse for the latter arises mainly from several entries which were allowed prior to the establishment of the reclamation area that embraced them. The most extreme such case had a time lapse of 547 months, nearly 46 years. In this instance the original homestead application was filed October 18, 1907, and the patent was issued on April 3, 1953. There were other instances of extremely long lapses before patent; for example, 370, 360, 416, 468, and 406 months. For the more normal reclamation claims, excluding "in lieu" units, the average time lapse was 59 months with a range from 36 to 97 months.

Successful applicants for homestead (ordinary) units received patents within a minimum of 30 months and a maximum of 109 months. The average time, as mentioned previously, was 72 months.

The time span for enlarged homestead tracts was greater, ranging from a minimum of 56 to a maximum of 143 months with an average of 88 months.

Homestead (ordinary and enlarged) entries which were terminated by cancellation involved more time to process than claims that were successful in gaining patent. The minimum time among 11 cases was 67 months, the maximum was 188 months (nearly 16 years), and the average was 104 months (8 1/2 years).

Table 4.--Total elapsed time between date of application and final disposition through issuance of patent or cancellation, by type of case and act

Type	Number of cases	Total time lapse in months from date of application to disposition		
		Average	Minimum	Maximum
Patented cases				
Homestead, ordinary	11	72	30	109
Homestead, enlarged	7	88	56	143
Desert land	24	89	47	151
Reclamation, regular	19	174	26	547
Reclamation, "in lieu"	7	8	3	15
Reclamation, ALL	26	130	3	547
Cancelled cases				
Homestead, ordinary and enlarged	11	104	67	188
Desert land	11	97	53	199

Source: Bureau of Land Management, Application Case Files, U.S. Department of the Interior, Washington, D.C.

TIME EXTENSIONS--WHY DO ENTRYMEN REQUEST MORE TIME?

Many reasons are given by entrymen for requesting more time in which to fulfill the requirements placed upon them by the law and other regulations. The reasons vary among types of homesteads, but some are: more time to establish residence; more time to submit proof; and time to make certain improvements, primarily the development of water sources and distribution of water. The following statements by entrymen illustrate the reasons cited in support of these requests.

Desert Land Entries

1. "I have not been able to perfect it (final proof) due to losing my irrigation pump and engine. I have to obtain another one and it will be about four months before it is installed. I am in the process of building a house on the property so if I can obtain an extension at once, I can finish it and get it fenced before bad weather starts." (This request was denied because of three previous requests all approved. The maximum number permitted under the law is three.)

2. This request gave several reasons which in essence were: (1) domestic problems, (2) bankruptcy of electric company causing loss of money, (3) loan failed to materialize, and (4) irrigation construction could not be completed until present month. (Request was rejected, subject to appeal.)

3. The entryman submitted three requests: "A desire for relief to perfect title by means other than reclamation by irrigation" (Claimant was given 90 days grace to permit consideration of his request which was subsequently denied). The entryman then filed a request "to prepare reasons for appeal." This request was approved. Later the claimant filed a third request "for more time to prepare reasons for appeal."

4. "Need more time to consolidate irrigation works with those of an adjoining land owner." (Request denied since question was "not how the entry is to be irrigated, but why the original plan was not carried out"--43 CFR 232.37 stipulates no extension unless it is clearly shown that failure is due to unavoidable delay in construction.)

5. In this case, three time extensions were granted. The first was for three years because "the irrigation company failed to deliver water." Later a one-year extension was based on the fact that "applicant is drilling a private well in view of failure of irrigation

company to develop and distribute water." The entryman made a subsequent request for more time, supported by a statement by a lawyer, that the entryman with three others had expended $9,000 to drill for water without success and that arrangements are being made for another attempt.

6. Request approved to "grant claimant relief provided for Desert Land Entries under Public Laws 86-552 and 88-645."

7. Similar to No. 6, that is, to take advantage of provisions of Public Laws 86-552 and 88-645.

8. Extension needed because "state water permit expired before entryman could make improvements due to delay in gaining entry."

9. Irrigation company failed to supply water; hence, three extensions were granted "to develop water supply."

Homestead, Ordinary and Enlarged Entries

1. Require more time due to "delay in road and building construction."

2. Two extensions granted: (1) leave of absence because of illness of wife, and (2) failure to establish residence.

3. Absence of one year granted because of illness. This did not extend the time for making proof. Later a six-month extension was allowed "to establish residence."

4. Extension based on choice of entryman to suspend cultivation as provided for by Public Law 834.

5. One year extension "to enable entryman to establish residence."

6. Six-month extension "to establish residence."

CANCELLATIONS--WHY ARE SOME ENTRIES TERMINATED?

The laws and regulations impose various obligations upon the entryman in terms of what he must do and when it must be done to earn patent. However, provisions are also included which enable administrators to grant one or more extensions of time under certain circumstances and upon proper request from claimant. An example is the allowable six months extension that can be granted to an applicant for an ordinary homestead and for the purpose of establishing residence. Failure of the claimant to file timely reports designed to measure the progress of development of the claim may result in automatic cancellation. This action is quite common due to failure of the entryman to file final proof and in the case of desert land entries, an annual proof.

In order to gain insight as to the reasons for cancellation and their frequency, a number of cancelled homestead and desert land entries were examined. In some instances several reasons for cancellation were cited by the Bureau of Land Management, and therefore the number of reasons cited exceeds the number of entries shown in the following summary:

Homestead entries cancelled	11
Reason cited for cancellation	
Failure to file final proof	4
Failure to establish residence	4
Failure to develop land for cultivation	3
Failure to submit timely notice of intentions to make proof	1
Land unsuited for cultivation	1
Failure to make improvements	1

Desert land entries cancelled	11
Reason cited for cancellation	
Failure to file annual proof	3
Failure to file final proof	4
Lack of water	1
Inadequate acreage under cultivation	1
Inadequate irrigation facilities	3

WATER SUPPLY PROBLEMS

The Role of Water in the Development of Intensive Agriculture

The water needs for intensive agriculture vary greatly, depending in part on such factors as soil type, kind of crop, and topography. Part of this study is concerned with problems surrounding the development of water supplies and their use for irrigation. Limited supplies of water can be extended and excesses can be minimized through good management in a limited way by individual actions but more broadly through collective effort. Examples of the latter are private and publicly financed organizations which develop sources of water and means of distribution through construction of canals, dams, pumping facilities and other extremely costly structures.

Most farmers engaged in intensive agriculture are dependent upon nature to supply rainfall on a timely and adequate basis. Applicants for ordinary and enlarged homesteads are legally in this category since the Homestead Act places little restraint on the claimant in regard to water and its use. However, the lack of water may be a contributing factor to the rejection of the application, that is, failure to gain entry; or it may prevent the entryman from developing an acceptable proof. Many homesteaders, especially in parts of the Western States where rainfall is meager, have failed because of crop failures during the period for proving up the claim. A serious question arises in this regard--have the entries been allowed on the basis of insufficient information on rainfall and other factors of production needed in the successful development of a claim? The high proportion of failures indicates that the answer is yes, even though 85 percent of the applications have been rejected. Of course, many other factors contribute to the high failure rate--illness, lack of initiative, poor management, and insufficient resources needed for development.

Under the Desert Land Act the applicant must include evidence with his application that he has already acquired by appropriate purchase, or contract, a right to the permanent use of sufficient water to irrigate and reclaim all of the irrigable portion of the land. If the irrigation water is to come from wells or be pumped from underground sources, a statement must be submitted as to the existence of such water supply upon or near the land. However, the fulfilling of these requirements does not preclude water problems for the applicant. Of 24 desert land entries included in this study, 16 experienced some type of water problem after making application.

SUMMARY

The results of this and other studies of administrative procedures relating to the Homestead Acts point to a number of conclusions:

1. The procedures foster a tremendous volume of paper work much of which is futile when measured against the goal of transferring public land to private ownership because so few applicants are successful in obtaining a patent.

2. The administrative cost when assessed against successful entries is unrealistically high. The very minimum pro-rated cost per ordinary homestead of 160 acres seems to be well over $4000, and it is over $8000 for a desert land tract of 320 acres.

3. Invariably both the applicant and administrator are confronted with a series of problems and frustrations during the processing of the application or during the development of the entry.

4. Administrative actions unfavorable to the applicant, though justified, are often misunderstood and become the basis of much ill will, particularly when the claimant has established residence, or made other improvements and erroneously holds the opinion that he has fulfilled his obligations. Frequently this leads to a series of appeals, to complaints to Congressmen and Senators and even to the office of President.

5. Circumstances, avoidable and unavoidable, combine to cause many and long delays in processing applications and after entry has been allowed. In fairness to the Bureau, it must be said that many delays are caused by failure of the claimant to do what is required of him by law on a timely basis. On the other hand, the Bureau has been slow in taking needed action, particularly in denying or allowing entry.

6. The high failure rate of applicants to gain entry suggests the need for more stringent screening of lands prior to making them eligible to application for settlement and use for intensive agriculture.

7. The relatively high failure rate of entrymen to gain patents suggests that some entries are allowed on the basis of insufficient information on factors like suitability and productivity of the land, climatic conditions, capabilities of the claimant, and accessability to markets.

8. Water, while basic to all intensive agriculture, is particularly important to desert land and reclamation entries since irrigation is involved. Desert land entries are particularly vulnerable to problems in the development of water supplies and distribution. The likelihood of water problems after entry are greatly minimized for reclamation homestead entries because proof of an adequate water supply is required before entry is allowed.

9. The high failure rate of homestead entries (ordinary and enlarged) might be substantially reduced if entrymen were required to file an annual proof. Such a requirement would serve to alert both administrator and claimant as to whether or not requirements are being met. At present a trend towards failure is not discovered until time of filing final proof which is required five years after entry.

DISPOSITION EXPERIENCE

The Homestead Acts provide legal machinery for disposing of public land to private ownership for intensive agriculture. It is the duty of the Bureau of Land Management, Department of the Interior, to administer the laws, but responsibility for the land is terminated upon issuance of a patent. However, for reclamation homesteads, the government retains a continuing interest because of agreements about irrigation water and water rights which are under the jurisdiction of the Bureau of Reclamation.

The Problem--Use Made of Patented Lands

What has been the experience of patentees, and what use has been made of the patented lands? Answers to these and other questions can be helpful in an appraisal of the various homestead laws. To gain information on these subjects, a number of patented cases were selected randomly for study of each type to represent a range of conditions and laws: 25 to represent actions taken under the Desert Land Act; 25 under the Reclamation Homestead Act; and 25 under the other Homestead Acts (original, enlarged and others).

Procedures

In each case supplementary current information was sought from local sources, and was collected in most instances on the following major subjects:

1. Ownership of the patented land
2. Use made of patented land
3. Acres in the farm units to which the patented lands belong
4. Value of improvements on the patented lands
5. Estimated annual gross farm income from the farm units to which the patented land belong, by source

The main features of the new information on current ownership by type of patent are shown in Table 5. This and the other subjects are discussed under subheads for each type of homestead. Also included is related information from an earlier study of desert land and homestead entries by the Bureau of Land Management.[7]

Since this study is concerned with experiences related to recently patented land, only patents issued during the 14-year,1950-1963, period were included.[8] Patents issued after 1963 were excluded since the subsequent period is so short that changes shown would be insignificant. The average year of patent is 1958 for the 89 tracts included in the study with the following distribution by years:

1950 - 3 1953 - 1 1956 - 6 1959 - 12 1962 - 6
1951 - 2 1954 - 3 1957 - 10 1960 - 11 1963 - 10
1952 - 2 1955 - 3 1958 - 10 1961 - 10

EXPERIENCE OF RECLAMATION HOMESTEAD ENTRIES

Information was collected through the Bureau of Reclamation in late 1968 for 26 patented tracts within the five major reclamation projects (1) Shoshone, Wyoming; (2) Riverton, Wyoming; (3) Coachella Division, All American Canal Project, California; (4) Yuma, Arizona; and (5) Minidoka, Idaho. Distribution of the 26 tracts by States is: five in Arizona; five in California; six in Idaho; and ten in Wyoming. The patents were issued during the period 1950-1960, with an average date of 1955. Main features of the experience of the 26 patentees and the current use of the patented land are presented under the following topic heads:

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[7] Bureau of Land Management, Agriculture Land Laws Effectiveness Study.

[8] The Appendix contains a more detailed discussion of procedure.

Table 5.--Current ownerships of land patented 1950-1963, by type of patent and kind of owner

Subject	Type of patent Desert land		Homestead enlarged		Homestead ordinary		Reclamation homestead		All types	
Number of patentees	21		24		18		26		89	
Period	1956-1963		1956-1963		1956-1963		1950-1960		1950-1963	
Year patented, average	1960		1959		1959		1955		1958	
Current ownership of patented land	No.	Percentage of patentees	No.	Percentage of patentees	No.	Percentage of patentees	No.	Percentage of patentees	No.	Percentage of patentees
Patentee, sole owner	9	43	12	50	11	61	6	23	38	43
Patentee, partial owner	1	5	---	---	---	---	3	12	4	4
Patentee, non-owner	11	52	12	50	7	39	17	65	47	53
Total patentees	21	100	24	100	18	100	26	100	89	100
New owners	15	71	15	62	11	61	35	134	76	85
Current owners[a]	25	119	27	112	22	122	44	169	118	133

[a]Consists of patentees who own all or part of the patented land and new owners.

Current Ownership of Patented Tracts

Six of the 26 still own the patented land, three have retained part, and 17 have relinquished all ownership interest as shown in Table 5. Hence, after an average lapse of 13 years following patent, about one-third of the patentees retained some ownership interest in the patented land while two-thirds had none.

New owners number 35, indicating a strong tendency to subdivide and parcel out the patented land.

Total owners number 44 (patentees 9, new owners 35)--an expansion of 18, or nearly 70 percent, over the original 26 ownerships. It was noted that of eight tracts having multiple but separate ownerships, one now has five owners, two have four, one has three, and four are each divided between two owners.

Distribution of Patented Acres Among Current Owners

At the end of 1968, patentees retained ownership of only 29 percent of the patented acreage as shown in Table 6. Furthermore, the patentees controlled a slightly smaller proportion (28 percent) of the other land in the farm units to which the patented lands belong.

Table 6.--Land in farm units to which reclamation patented lands belong, by kind of acres and type of current ownership

	Ownerships (number)	Acres	Acres (percent)	Acres per unit
Total acres in farm units	44	7383	100	168
Owned by patentee	9	2122	29	246
Owned by others	35	5261	71	150
Patented acres in farm units	26[a]	3405	100	131[a]
Owned by patentee	---	989	29	---
Owned by others	---	2416	71	---
Other acres in farm units	---	3978	100	---
Owned by patentee	---	1131	28	---
Owned by others	---	2847	72	---

[a]Refers to the 26 tracts patented.

Taking into account all land (patented and other) in farm units to which the patented acres belong, the patentees control 29 percent and the other owners 71 percent of all land.

Size of Farm Units to Which Patented Lands Belong

The 26 entries studied received patents for 3405 acres, an average of 131 acres per patent (Table 6). These acres are now owned by 44 owners, but besides the patented acres these owners have an additional 3978 acres of other land in their farm units. When these acreages are combined (3405 acres patented and 3978 acres of other land), the total acreage in the farm units to which the patented acres belong is 7383, an average of 168 acres per unit. Hence, the patented lands are now attached to farm units which are 28 percent larger than the tracts patented. This is a rather insignificant change compared with that in farm units to which desert land and homestead patented lands belong.

Value of Improvements on Patented Land

An effort was made to obtain an estimate of the value of improvements on each of the 26 tracts of patented land. Improvements included items such as buildings, fences, roads, ditches, leveling, pipelines, and reservoirs. Two tracts were reported as having no improvements. In contrast, one unit had reported improvements of $135,200. This wide range in the value of improvements among units is also evident on a per acre basis (Table 7). The value of improvements on the 26 reclamation patents averaged just under $27,000 per patent and slightly more than $200 per acre patented.

Estimated Gross Farm Income of Farm Units to Which Patented Acres Belong

Information was obtained for 25 of the 26 patents under study. The 25 tracts are now part of 42 farm units for which information on gross farm income was received. Principal features of the 42 units were:

Gross farm income averaged just under $15,000 per unit with 94 percent from crops and six percent from livestock. Eight units had income from livestock and 33 had income from crops; seven had no farm income; two had income only from livestock; and 26 had income only from crops. The maximum gross per unit was $63,000, all from crops. For livestock, the maximum reported was $10,000.

Table 7.--Number of patented tracts reporting value of improvements as specified; value per tract and per acre

Improvements per tract	Number of tracts	Improvements per acre	Number of tracts
$ 0	2	$ 0	2
1 - 5,000	7	1 - 50	7
5,001 - 10,000	1	51 - 200	6
10,001 - 20,000	5	201 - 400	7
20,001 - 50,000	6	401 - 600	2
50,001 - 100,000	4	601 - 800	1
100,001 and over	1	801 and over	1
Total	26		26

The distribution of total gross farm income per unit had this form:

Dollars	Number of units
0	7
1 - 5,000	7
5,001 - 10,000	4
10,001 - 20,000	13
20,001 - 30,000	7
30,001 plus	4

ENLARGED HOMESTEAD ENTRIES

A group of 24 enlarged homestead entries were studied to learn the disposition and use made after patent. Current information on status was obtained partly by interviews and partly through correspondence and telephoned inquiries. The county offices of the Agricultural Stabilization and Conservation Service furnished most of the information with assistance from personnel of other agencies and local residents who were acquainted with the patentee and had knowledge of the patented land.

Current Ownership of Patented Entries

The data show that 50 percent of the patentees still retained full ownership at the end of 1968 (Table 5). The other 50 percent had conveyed all of their land. Eleven of the 12 tracts were conveyed intact while one was divided and acquired by four new owners. As a result of this split, total owners expanded from 24 to 27, including 15 new owners and 12 original patentees. This small expansion in the number of owners is in contrast to the sharp rise shown for the reclamation homestead type--from 26 patentees to 44 current owners.

Additional insight into the disposition of patented land is available from a 1960 study by the Bureau of Land Management.[9] Preliminary results as of January 1963 are partly reproduced in Table 8. While these data are a combination of homestead and desert land patented entries, they too show the strong tendency of entrymen to dispose of all or part of their claims rather soon after receiving patent. For example, in Idaho which had the most patented entries, over 40 percent of the patentees who had made application during the 1950-1959 period and received patents prior to 1962 had disposed of all their patented land by the summer of 1962. The percentage was even higher in Arizona, 58 percent; California, 45 percent; Oregon, 54 percent; and Nevada, 42 percent. Furthermore, in Oregon another 10 percent had conveyed part of their land.

Distribution of Enlarged Patented Lands Among Current Owners And Use Made of Homestead and Desert Land Entries

By late 1968, enlarged homestead patentees had disposed of 61 percent of their patented lands. The average year of patent was 1959 for the 24 entries (Table 5).

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[9] Bureau of Land Management, Agricultural Land Laws Effectiveness Study.

Table 8.--Ownership of homestead and desert land entries patented prior to 1962: Number of patented entries and status in the summer of 1962, in percent, by States

State	Number		Percentage of entrymen who--		
	Total[a]	Used in study	Still held their land	Had conveyed part of their land	Had conveyed all of their land
Arizona	99	91	42	---	58
California	117	106	47	8	45
Colorado	50	35	77	---	23
Idaho	641	540	53	7	40
Montana	9	7	71	---	29
Nevada	213	117	50	8	42
New Mexico	65	50	68	12	20
Oregon	49	35	54	11	54
Utah	119	104	72	2	26
Washington	9	8	62	---	38
Wyoming	111	79	68	1	31

Source: Bureau of Land Management, Agricultural Land Laws Effectiveness Study (1960).

[a] From applications made during the 1950-1959 period.

The Bureau of Land Management study showed that a fairly large proportion of entries were not in use or were not used for farm purposes in the summer of 1962 (Table 10). For example, in Arizona 36 percent of the patented entries were not being used for farming and in California the proportion was even higher, 46 percent. Other high ratios were: Nevada, 44 percent; Wyoming, 47 percent; and New Mexico, 20 percent. By contrast, in Idaho 94 percent of entries were used for full time or part time farming. Idaho had the most patents issued prior to 1962 from applications made during the 1950-1959 period.

Size of Farm Units to Which Patented Lands Belong

The 24 original patented entries averaged 199 acres in size. At the end of 1968, these tracts had become a part of 27 farm units whose average size was 1948 acres (Table 9). Even after discounting the effect of one very large unit of 15,300 acres, the average size of the remaining 23 farm units was 1628 acres. Hence, the farm units to which the patented lands belong are at least eight times larger than the average of the original entries.

Table 9.--Land in farm units to which the enlarged homestead patented lands belong, by kind of acres and type of ownership

	Number of ownerships	Acres	Acres (percent)	Acres per unit
Total acres in farm unit	27	52,590	100	1,948
Owned by patentee	12	21,484	41	1,790
Owned by others	15	31,106	59	2,074
Patented acres in farm units	24[a]	5,352	100	199[a]
Owned by patentee	--	2,176	41	---
Owned by others	--	3,176	59	---
Other acres in farm units	--	47,238	100	---
Owned by patentee	--	19,388	41	---
Owned by others	--	27,850	59	---

[a] Refers to the 24 tracts patented.

Table 10.--Homestead and desert land entries patented prior to 1962: Use in the summer of 1962, by States

State	Number: Total[a]	Number: Used in study	Percentage of total patented entries that were--: Fulltime or part time farms	Used for non-farm purposes	Not in use
Arizona	99	91	64	3	33
California	117	106	54	7	39
Colorado	50	35	82	9	9
Idaho	641	540	94	1	5
Montana	9	7	100	---	---
Nevada	213	117	56	22	22
New Mexico	65	50	80	6	14
Oregon	49	35	92	8	---
Utah	119	104	82	4	14
Washington	9	8	100	---	---
Wyoming	111	79	53	1	46

Source: Bureau of Land Management, Agricultural Land Laws Effectiveness Study (1960).

[a] From applications made during the 1950-1959 period.

Value of Improvements on Patented Lands

The value of improvements differs greatly among patented entries. Current information indicated no improvements of value on nine of 24 entries; another six had $1,000 or less in improvements; but, in contrast, one had improvements valued at $65,000 and another at $15,000 The average estimated value of improvements on the 24 patented entries was $4,793.

Estimated Gross Farm Income of Farm Units to Which Patented Acres Belong

Information was obtained for 21 of the 24 patented entries. These 21 entries are now a part of 24 farm units whose gross farm income averaged $21,008. About 74 percent of this income came from crops and 26 percent from livestock.

Of the 24 farm units, only one had no income from either crops or livestock, 23 had income from crops, and 12 from livestock. Only three units received more income from livestock than from crops. The range in total income per unit was from the one case of zero to a high in another instance of $159,000. The second highest gross income was $59,685, all from crops. The unit having the highest gross income of $159,000 received $78,000 of it from crops and $81,000 from livestock.

HOMESTEAD ORDINARY ENTRIES

The sources of information and the procedures used in collecting data on the homestead ordinary entries were similar to those previously described for homestead enlarged units. However, for this type it was more difficult to obtain information on the size of farm units, crop production, and annual gross income of units to which the original patented lands belong. This was mainly due to the remoteness of some tracts and the absence of the owner or operator from the area. Some tracts have been idle while others are operated on a non-resident basis. In the latter cases, it was difficult, and sometimes impossible, to locate anyone who had reliable knowledge of the operations. The analysis for each subject is largely based on entries with complete information, as mentioned in the text or shown in related tables.

Current Ownership of Patented Tracts

Current ownership status was determined for all 18 entries within the study as shown in Table 5. Eleven retained full ownership while seven had conveyed all their patented land. Hence, 61 percent still owned their patented land after patent while 39 percent did not.

Seven entries had conveyed all of their patented land to 11 new owners. In one instance, the patented tract was divided and conveyed to four new owners while another was sold to two. The other five entrymen each conveyed his entire tract to one new owner.

These transactions resulted in an expansion in the number of owners from the original 18 to 22 current owners (11 patentees and 11 new owners). From this it appears that there is little tendency to subdivide this type of homestead prior to sale.

Distribution of Patented Acres Among Current Owners

It was possible to obtain complete data on this subject for 13 of 18 entries under study. The partial information for the other five entries indicates that they are still owned by the patentee but are not operated. Therefore, it seems unlikely that these five patentees own and operate other land as part of the total farm unit. If this is the situation, then the 18 original patentees retain 68 percent of the patented acreage and control 49 percent of all land in the farm units to which patented lands belong. However, there is little evidence of agricultural activity on nine of the 11 units still controlled by the patentees. In contrast, only three of the 11 units controlled by new owners were inactive. Table 10 provides further information on use of patented tracts. The data for the 13 entries for which information is complete is reported in Table 11.

Size of Farm Unit to which Patented Lands Belong

The original 18 patented entries studied contained 2,416 acres, an average of 134 per patent. These lands are now part of 22 farm units consisting of 3,344 acres, an average of 152 acres per unit. It is assumed that the five entries lacking complete information are unchanged, as previously explained.

Table 11.--Land in farm units to which the homestead ordinary patented lands belong, by kind of acres and type of current ownership

Subject	Number of ownerships	Acres	Acres (percent)	Acres per unit
Total acres in farm units	13[a]	2,590	100	200
Owned by patentee	6	893	34	149
Owned by others	7	1,697	66	242
Patented acres in farm units	13[a]	1,662	100	128[a]
Owned by patentee	--	893	54	---
Owned by others	--	769	46	---
Other acres in farm units	--	928	100	---
Owned by patentee	--	---	---	---
Owned by others	--	928	100	---

[a] These data are for 13 of the 18 entries in the study. Land distribution information was incomplete for the other five. The original 18 entries averaged 134 acres per patent compared with 128 for the 13 reported in Table 11.

Value of Improvements on Patented Land

Of the 18 patented entries, all but one had improvements of value that ranged from $40,000 to $2,000. The average for the 18 tracts was just over $13,000. In a number of instances, residences accounted for a substantial proportion of the value of improvements even in cases where the tracts were idle. The average value of improvements per patented acre was $97.

Estimated Gross Farm Income of Farm Units to Which Patented Acres Belong

Information obtained for 21 of 22 farm units to which the patented lands belong indicates that gross farm income averaged $2,636 per unit with 79 percent from cropland and 21 percent from livestock. Four of the 21 units had income from livestock, and ten had income from crops while 11 had no farm income. The distribution of total gross farm income per unit was:

Dollars	Number of units
0	11
1 - 5,000	6
5,001 - 10,000	3
10,001 plus	1

The maximum gross income from crops for one unit was $8,500; from livestock, $8,000, and from both crops and livestock, $11,650.

DESERT LAND ENTRIES

The plan was to obtain information for 25 desert land entries (Appendix A). It was possible to obtain data for 21 on nearly all subjects being considered. In three instances information was lacking on the value of improvements on patented lands, and in four others on the amount and source of farm income. The analysis for each subject is based on only those entries for which complete information was available for the specified topic. Distribution of the 21 entries by States:

Arizona	1	Nevada	5
California	3	New Mexico	1
Idaho	8	Oregon	1
Montana	1	Utah	1

Current Ownership of Patented Tracts

The 21 entries studied were patented during the period 1956-1963, the average date being 1960. By the end of 1968, eight years later, about half of the patentees had disposed of all of their patented lands. Nine of 21 were still sole owners; one still retained part of the patented land; eleven had conveyed all of their land; and total ownerships increased from 21 to 25. In four instances the patented lands were acquired by two new owners. The small increase in owners suggests that for desert land entries there is little tendency to divide the patented tracts prior to transfer. Instead, there is a strong tendency for patentees who retain their patented land to acquire additional acreage and for new owners to secure patented acreage to enlarge existing units (Table 12).

Distribution of Patented Acres Among Current Owners

Distribution data by ownership was obtained for all 21 entries now part of 25 farm units (Table 12), and indicates that patentees still own just under 50 percent of the patented land and roughly two thirds of the other land in the farm units to which the patented lands belong.

The 21 original patented entries included 4,632 acres, an average of 221 acres per patent. In late 1968, these acres were part of 25 units containing 42,978 acres, an average of 1,719 acres per farm unit (Table 12). Included is one very large unit made up of the original patented entry of 120 acres and 21,806 acres of other land for a total acreage of 21,926 acres devoted entirely to livestock production. If this extremely large and unusual unit is excluded from the group, the remaining 24 units average 877 acres per farm unit. Even this smaller average size indicates that the patented lands are now part of farm units which are at least four times larger than the original entries.

Table 12.--Land in farm units to which desert land patented lands belong, by kind of acres and type of current ownership

Subject	Number of ownerships	Acres	Acres (percent)	Acres per unit
Total acres in farm unit	25	42,978	100	2,719[a]
Owned by patentee	10	27,958	65	2,796[a]
Owned by others	15	15,020	35	1,001
Patented acres in farm units	21[b]	4,632	100	221[b]
Owned by patentee	--	2,188	47	---
Owned by others	--	2,444	53	---
Other acres in farm units	--	38,346	100	---
Owned by patentee	--	25,770	67	---
Owned by others	--	12,576	33	---

[a] Excluding one extremely large unit of 21,926 acres operated by the patentee, the averages are 877 and 670 respectively, and the proportion of land under control of patentees drops from 65 to 29 percent.

[b] Refers to the 21 original patented tracts.

Value of Improvements on Patented Land

The results are based on data for 18 of the 21 patented entries. For the 18, the value of improvements averages slightly more than $20,000 per tract and $97 per patented acre.

Improvements on one entry were valued at $100,000, the highest for any tract. In contrast, one which was part of a large unit not owned by the patentee is reported to have no improvements on the acres patented. Four entries had improvements valued at less than $5,000 each, while three others were under $10,000. The nine remaining entries had value of improvements ranging between $10,000 and $40,000.

Estimated Gross Farm Income of Farm Units To Which Patented Acres Belong

Data on farm income was obtained for 19 of the 25 farm units containing the patented land. Three of the units lacking income information are operated by new owners, while two are patentee operated. The data for the 19 farm units show average gross farm income per unit to be $10,430 with 60 percent from crops and 40 percent from livestock; three units had no farm income; 12 had income from crops; and four had income from livestock. The maximum income from crops was $26,000; from livestock, $40,000; from both crops and livestock, $42,500. Income distribution was as follows:

Dollars	Number of units
0	4
1 - 5,000	5
5,001 - 10,000	4
10,001 - 20,000	3
20,001 plus	3

SUMMARY

The information collected on the disposal and use experience of patented entries suggests the following conclusions:

Ownership of patented lands. Patentees tend to dispose of much of the patented land relatively soon after patent. Approximately 50 percent of those receiving patents during the period 1950-1963 had disposed of all their patented land by the end of 1968.

Change in number of owners and size of farm units. During the process of conveying patented land, there is a tendency for the number of owners to expand. This is particularly noticeable for the reclamation type homestead. Also there is a strong tendency of owners to acquire more lands as additions to existing farm units. The average increase in size of farm units to which patented lands belong was only moderate for reclamation types--from 131 to 150 acres. For ordinary homesteads the increase was much more substantial, from 128 to 200. For enlarged homesteads the increase over the patented acreage was tenfold, from 199 to 1,948 acres. The desert land type also increased very sharply--about eight times--from 221 to 1,719 acres.

The tendency is for patented lands to become parts of farm units much larger than the patented tracts, especially desert land and enlarged homestead entries. The enlargement occurs through the addition to the original entry of other land by the owners of the patented tract, or by adjacent operators who add the patented tract to an existing unit. The latter is the more common practice. For reclamation entries, this trend is offset partly by the break up of some entries into smaller tracts in areas of very intensive agriculture, as in the production of citrus. Likewise, for homestead ordinary entries the upward trend in size of unit is minimized by a high proportion of idle, or nearly inactive, patented entries that tend to remain constant in size.

The data indicate that the acreage limitation of 320 acres per entry imposed by the Desert Land and Enlarged Homestead Acts is unrealistically low. This conclusion is supported by farm income data showing that entries which have not become part of larger units have nominal productive capacity and therefore develop relatively little income. For example, in southwest Colorado and southest Utah where wheat is a major crop, wheat acreage allotments become an important consideration in the acquisition of additional land. Furthermore, in many instances, it is necessary to summer fallow in alternate years as a means of conserving meager water supplies. This need encourages and requires some farms to enlarge their units to include a crop acreage base big enough to provide adequate income to meet fixed costs and other expenses.

In the case of homestead ordinary entries, the size of the units seems to have little bearing on success as measured by income. Seemingly more important are factors such as location, suitability of land for intensive agriculture, and climatic conditions. For reclamation entries, the adverse effects of these factors are minimized prior to entry approval. Hence, reclamation tracts have a better chance of success even though the unit is small. The human element, that is the managerial and other capabilities of the operator, plays an important role in determining the success or failure of entries of all types.

The average size of patented entries is substantially less than the maximum permissible acreage under each authority. This raises a question--should there be a minimum permissible acreage for entry in view of the economic pressures (economy of size), and also a higher maximum? The answer seems to be definitely "yes" for desert land entries and enlarged homesteads. A minimum may be in order also for homestead ordinary and reclamation entries.

A comparison of permissible maximum acres and average size of patented entries follows:

Type	Maximum acres	Patented entries: Average acres	Patented entries: Percentage of maximum
Homestead, ordinary	160	128	80
Homestead, enlarged	320	221	69
Desert land	320	199	62
Reclamation homestead	160	131	82

Of the various types, reclamation entries lead in the value of improvements on both a per tract ($27,000) and per acre ($206) basis. These compare with $20,000 and $97 respectively, for desert land entries, $13,000 and $97 for homestead ordinary entries, and about $4,800 and $21 for enlarged homestead patented entries.

Improvements on reclamation lands are primarily related to preparing the tracts for irrigation and require large investments in items such as leveling, ditching, and pipelines. Such improvements are also factors of importance to desert land entries, but in addition, residences and general farm buildings appear to be more generally found on the latter type.

Ordinary homestead entries have a rather high average amount of improvements, but a substantial proportion relates to the cost or value of the residence. For this type of entry the entryman must establish residence and live on the tract a specified period to earn patent. If successful, he may make a heavy investment in a house before or after patent. Even should he fail and the tract become idle, some of the value of the residence may be retained for some time. It was noted that a number of patented entries now idle, perhaps abandoned, still have substantial value of improvements reported with the residence accounting for a large proportion.

The homestead enlarged patented entries tend to have few improvements since many operators do not reside on the land and their agricultural activities are of the less intensive type. There are exceptional instances of successful entrymen who reside on the original patented tract and who have acquired additional land and made many improvements. In such cases the improvements often include a substantial residence, storage facilities, fences, and general farm buildings.

In general the patented acres are used primarily for various forms of intensive agriculture, although some, particularly desert land and homestead enlarged acreages, have become parts of farm units whose major source of income is from livestock production.

Reclamation patented acres tend to be used almost exclusively to produce income from highly intensive crops such as citrus, potatoes, beans, and sugar beets. Few reclamation acres are idle compared with homestead ordinary patented acres. Many of the latter type are part of patented tracts which have been temporarily or even permanently abandoned and to a considerable degree these account for the low average income per farm unit (about $2,600) to which the homestead ordinary patented acres belong.

Crops are the principal source of income for farm units containing patented acres, all types and this is the intent of the laws. Based on patented entries for which information is available, the approximate percentage of gross farm income from crops for each type is: reclamation, 95 percent; homestead ordinary, 80 percent; homestead enlarged, 75 percent; and desert land, 60 percent.

C. PERMITTED USES OF PUBLIC LANDS FOR INTENSIVE AGRICULTURE

INTRODUCTION

Prior to 1900 the private use of federal lands usually occurred without specific permits and without effective efforts at prevention or regulation. Federal lands were grazed, roads were built, and timber was cut. The General Land Office tried on occasion to stop such trespasses, but the Congress and the public either were indifferent or encouraged such uses.

The first legal attempt to stop indiscriminate use was the Act of 1897 which brought National Forest lands under constructive administration. In 1934 the Taylor Grazing Act set up legal authority to control grazing on public lands. This act, which also halted indiscriminate disposal of public lands, applied to 156,416,000 acres of federal lands as well as 108,668,000 acres in other ownerships.[1]

Since the enactment of the Taylor Grazing Act, several agencies of the federal government have established leasing or permit practices on their respective public lands; however, permits or lease arrangements have been made much more frequently for non-agricultural and grazing purposes than for intensive agriculture.

REQUIREMENTS, SCOPE AND LIMITATIONS OF THIS STUDY

The requirements for this portion of the study were outlined in the Work Plan.

"(1) Classify and tabulate acreage of public lands used for intensive agriculture under permit, by States, annually for the period 1957-1966. Classify by major type of crop and by irrigated and nonirrigated acreage."

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[1] Marion Clawson and Burnell Held, *The Federal Lands: Their Use and Management* (Baltimore: Johns Hopkins Press, 1957), pp. 45-85.

"(2) Tabulate payments to the federal government for use of land indicated in 3b (1) above by same classifications, and fees or rates used as the basis for determining such payments."

These data were requested of the appropriate federal agencies directly by the Public Land Law Review Commission in Washington, D.C. Although Commission staff members made repeated requests, information provided was fragmentary and incomplete. The reasons for the inability or unwillingness of the agencies to supply these data are not known to the contractor. (This situation contrasts sharply with the very satisfactory responses of most of these same agencies to requests for data on other aspects of the study.) Responses of the various agencies are included in Vol. III, pp. 230-231.

Since the data were incomplete, they could not be analyzed in either the depth or the detail desired by the Commission. However, it was possible to combine available data and some qualitative information to arrive at tentative findings on permitted uses for intensive agriculture.

AGENCY LEASE OR PERMIT REQUIREMENTS

Each agency which leases or permits public lands for intensive agriculture has its own regulations. The following is a short summary of these regulations as reviewed in "Legal Study of Federal Public Land Laws and Policies Relating to Intensive Agriculture."[2] Only the regulations of agencies controlling a substantial quantity of land are discussed here.

Department of Defense

The military departments may lease lands not presently needed for governmental use. The objectives of leasing are to promote the national defense or the national economy, to provide maintenance of government property by lessees, and to secure the maximum cash return to the United States consistent with the achievement of the other objectives.

Lands available for leasing are either within military installations or on lands acquired for Army Civil Works projects but not being used for such purposes. The regulations state that land within military installations may be leased for agricultural use while agricultural lands acquired for Civil Works projects must be leased in order that the land will not deteriorate from the growth of undesirable vegetation.

The regulations contain no particular requirements for a lessee. Usually leases are awarded through competitive bidding; however, negotiated leases are permitted, and preference is given the former owner or tenant or his surviving spouse. The amount of land to be leased by an individual is not regulated except that large land areas must be divided into economic agricultural or grazing units.

A lease can be revoked at any time. The lease term is for not more than five years unless the Secretary determines that the term is not in the public interest. Rents are to be not less than fair market value.

The regulations--and the form leases--used by the military have various terms and conditions. Some are standard. Others provide that, except under certain conditions, leases shall prohibit production of price supported crops. The exceptions usually apply to former owners and tenants who are allowed to continue production of crops after the land is acquired by the government. In leases of two or more years, crop rotation plans are included in use regulations; in leases for two years or less, land uses are specified in the leases. The regulations further require the lessee to avoid federal cost sharing for soil conservation practices because the reduced rent supposedly reflects a subsidy. In general, the lessee is to leave the property in as good order and condition as it was at the beginning of the lease, normal wear and tear excepted.

Department of Agriculture

The Department has established policies and procedures for granting permits for agricultural use of Forest Service lands, and the Forest Service issues terminable special permits for lands which will be particularly useful for growing agricultural products. These are (1) lands suitable for cultivation which are adjacent to other public lands and can be connected therewith, (2) unneeded arable lands at administrative sites, (3) acreages too small for homesteading, (4) cultivable lands included in areas acquired by purchase, exchange, donation, or transfer.

Like the Department of Defense, the Department of Agriculture sets no lessee qualifications nor any acreage limitations, but permits are granted on the basis of experience and qualifications. The only limitation on acreage is that the amount of land permitted be kept as small as is consistent with intended use. Rents are established by the

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Kronick,and others, "Legal Study of Federal Public Land Laws and Policies," pp. 393-422, Volume I of this study report.

Chief of the Forest Service, but the Forest Service Handbook provides that the minimum shall be not less than one dollar per acre or five dollars per permit. Fees are 1/5 to 1/3 of the average market value of crops produced; fees from uneconomic units can be waived in whole or in part by offices issuing the permits.

The permittee is required to carry out soil conservation practices as described by the permit, and he must not grow price supported crops in surplus supply--subject to the penalty of losing his permit.

Bureau of Reclamation

Lands subject to lease are not specified but can be leased to United States citizens, domestic corporations, or governmental entities. Preference is given to project water users, local settlers or landowners. The highest bidder receives the lease except that the owner of land acquired by government purchase or condemnation is given preference. Leases may be negotiated when negotiation is believed to be in the best interest of the United States.

Unlike other agencies the Bureau of Reclamation does not lease lands in units greater than 160 acres. Rents are based on the characteristics of the land and are comparable to charges for similar land in the area.

While statute allows leasing for 50 years, the practice is to grant one year leases with an option for four annual renewals. No renewals are allowed after the agricultural lease has been in effect for five years, but the individual can bid again for the same lease.

Leases may be assigned if approved by the government and if fees incurred are paid; sub-leases may be cancelled when national interest so requires.

Approval of cropping plans must be secured before crops are planted. Leases restrict the growing of crops in surplus supply, and they usually require the incorporation of soil conservation practices.

Bureau of Sport Fisheries and Wildlife

Because of the need to raise feed for wildlife on some of the land controlled by the Bureau of Sport Fisheries and Wildlife, the policies of this agency differ in three important respects from those of other agencies. First, the Bureau prefers to enter into crop sharing arrangements instead of cash leases or fees. Second, cultivation is allowed on lands providing refuge for wildlife. Third, in some cases, the Bureau farms its land with its own personnel.

Lands subject to lease or agreement are determined by their direct or indirect benefit to wildlife using the refuge, and crops grown on the land are those deemed necessary and beneficial to wildlife. Usually small grains, which may include price supported crops, are grown because they are desirable feed. The usual lease provides a crop rotation program for each year.

The only qualification of a lessee is that he be willing and equipped to perform the special tasks needed to accomplish the objectives of management. Priority is given to lessees who reside in the area while the present holder of a permit or agreement is given priority when it is time for renewal.

The Bureau has no acreage limitation but attempts to accommodate as many people as possible rather than allowing a few people to monopolize the land. Rent is of a crop sharing nature and cash leasing usually is not acceptable. However, cash leasing is at times the only way to keep fields in production.

Bureau of Land Management

A unique use of federal lands for intensive agriculture has occurred along the lower Colorado River. These lands were withdrawn from the public domain by the Bureau of Reclamation for reclamation projects. However, over the years, individuals have been using the land as trespassers. After trespassing was brought to the attention of Washington, attempts were made to remove the illegal occupants. Such action was very unpopular, time consuming, and costly, so a decision was made to encourage occupants to apply for permits. This program originally allowed five year terms, but at present, permits are issued on a year to year basis.

The maximum arable acreage within the permit area is 160 for single applicants and 320 for a man and wife. Permittees are required to pay an annual rent for use of the land. Efforts to place all occupants under permits are continuing, but there still are cases of illegal use.

The foregoing account gives some idea of the regulations of the various agencies which lease or permit the use of agricultural lands and also points up the diversity of permit regulations. Such diversity reflects variations in the natures and objectives of the agencies.

AMOUNTS AND CONTROL OF LANDS INVOLVED

In order to put the subject of permitted use of intensive agricultural land into perspective a brief recapitulation of the acreage of federal land holdings seems in order.

The federal government owns approximately 406,299,000 acres in the 48 contiguous States, or 21 percent of the total acreage. The corresponding figures for the 17 Western States are 371,325,000 acres and 32 percent (Table 1, Part IIA). Of total federally owned land, about 3,308,000 acres (total of dryland and irrigable) are considered suitable for intensive agricultural uses (Table 1, Part IVA); however, only 2,600,000 are controlled by the four agencies whose land policies would allow agricultural development. These are Bureau of Land Management, Bureau of Reclamation, Corps of Engineers, Forest Service (LU lands only).

Three agencies control approximately 75 percent of all federal acres in the 48 contiguous States. The Department of Agriculture's 165,980,000 acres are almost all (165,597,000 acres) under the supervision of the Forest Service. The Department of the Interior has control of 210,047,000 acres, 176,000,000 being the responsibility of the Bureau of Land Management. The third agency that administers considerable federal land is the Department of Defense with approximately 27,425,000 acres.

The remaining federal lands in the 48 contiguous States are distributed among some 50 different agencies. These include, for example, the Bureau of Prisons with 39,460 acres, the Central Intelligence Agency with 744 acres and the Bureau of the Mint with 83 acres. It is understandable that these agencies would have little, if any, land to lease or permit.

The approximate acreage of federal lands leased (or permitted) for intensive agriculture in recent years is about 1,010,000 in the 48 contiguous States including 596,680 in the 17 Western States. The Departments of Defense and Interior control most of these lands.

AN ANALYSIS BY HYPOTHETICAL YEARS

As was indicated earlier, the data supplied by agencies were incomplete and covered differing years or periods. In order to give some meaning to the results of analyses it was decided to create hypothetical permit years both for the States and for the agencies. This was accomplished by averaging the available annual data from each agency for each State. Admittedly, some judgment decisions were involved, and the resultant measure is less than precise. These hypothetical permit years fall somewhere within the overall period 1957-1968, but some agencies supplied information ranging over the entire period while others provided only very recent data. Since it was necessary to use unweighted averages, the overall totals by agencies or by States do not correspond exactly.

Permitted Use, by Agencies (Hypothetical Year)

The Department of Defense controls most of the federal land reported to be leased out for intensive agricultural use. On a hypothetical permit year basis the Department administered 5,104 permits and leases covering 839,483 acres. The total revenue was $2,580,722 or an average of $3.07 per acre. The reports classified these as Army (Civil Works), Army (Military), Air Force and Navy (See Table 1).

Most of these Department of Defense permits were listed as Army (Civil Works). This category included 4,498 permits covering 572,045 acres. The next smaller category was Army (Military) with 399 permits covering 168,804 acres. The Navy and Air Force had 116 and 91 permits respectively, covering 82,813 and 19,821 acres. Average permit size varied from the Navy's 713 acres to 127 acres for the Army (Civilian Works). Army (Military) and Air Force permits averaged 423 and 174 acres respectively. Rent per acre varied from $1.68 for the Navy to $4.44 for the Air Force. Although the Navy had the lowest per acre rent of any agency for the hypothetical year, one of its 1968 permits in Arizona averaged $180.00 per acre, the highest rent reported by any agency.

The Department of the Interior controls 210,047,000 acres. On the basis of the hypothetical year a total of 1,403 permits was issued on 179,296 acres, and average permit size was 128 acres. Revenue was not calculated because of lack of information for some agencies.

Seven agencies in the Department of the Interior granted 1,403 permits covering 179,296 acres as follows: Reclamation, 289; Lower Colorado River Land Utilization, 70; Lower Colorado River Land Utilization (trespass), 15; National Wildlife Refuge Farming Program, 581, and Haying Program, 361; National Park Service, 66; and Bureau of Land Management, 21. Acreages permitted were: Reclamation, 35,069; Lower Colorado River Land Utilization, 5,388; Lower Colorado River Land Utilization (trespass), 2,950; National Wildlife Refuge Farming, 111,851 and Haying, 20,162; National Park Service, 3,551; Bureau of Land Management, 325 (Table 1).

Average permit size varied from 193 acres for the National Wildlife Refuge Farming Program to 15 acres for the Bureau of Land Management. Permit averages of other agencies were as follows: Reclamation, 121;

Lower Colorado River Land Utilization, 77; National Wildlife Refuge Haying, 56; and National Park Service, 54. In the lower Colorado River area where the government is attempting to halt trespasses, average permit size was less than half that of the average trespass.

The Forest Service (U.S. Department of Agriculture) controls 165,597,000 acres in the 48 contiguous States. Approximately 1,188 permits a year were issued on 37,094 acres with permits averaging 144 acres and rent per acre ranging from $1 to $15 (Table 1).

National Aeronautics and Space Administration had 72 permits on 3,444 acres with a permit average of 48 acres. Average rent per acre was the highest of any agency at $77 and total revenue was $265,458 (Table 1).

Permitted Use, by States (Hypothetical Year)

Approximately 8,273 permits covering 1,010,064 acres were reported for the 48 contiguous States. The average permit size was 122 acres, and annual revenue was $5,696,951 (Table 2).

In the 17 Western States there were 3,726 permits covering 596,680 acres with an average acreage permit of 160. In the 31 Eastern States 4,547 permits covered 413,384 acres and the average permit was 91 acres.

Kansas had the largest number of permits (708), followed by South Carolina (655), Mississippi (619), Oklahoma (580) and North Dakota (579). The fewest were in Delaware (2), Maine (3), and Massachusetts (5). Rhode Island had none.

The larger acreages under lease were in Oklahoma (128,889), Kansas (111,754), Texas (91,166), Missouri (82,214), and North Dakota (60,288). The smaller acreages were in West Virginia (187) and Vermont (322).

Revenue figures do not include all money received from all agencies--the Bureau of Land Management and the Forest Service did not report revenue. The larger annual revenues were in California ($1,557,858), Iowa ($444,094), Nebraska ($404,909), Kansas ($397,474), and Missouri ($285,671).

There was very little relationship between the numbers of acres under permit in given States, and total acreage of federally controlled land in those States. Kansas, Oklahoma, Mississippi, Texas and Missouri, for example, had rather large numbers of permits or acreages for intensive agriculture and relatively small amounts of federal lands. California, on the other hand had both large amounts of federal lands and a large number of permits (499 for 98,871 acres).

AN EXAMINATION OF THE DATA AS REPORTED

Data reported directly by the agencies complement the information gained through analysis of hypothetical permit years and are of additional value in two respects: first, actual data from a particular agency, year, or State modifies the data provided by hypothetical years; for example, in the previous discussion of the number of permits by States and agencies, the hypothetical year supplied no information on the number and acreages of permits during the included years. Second, actual data provide information on items which cannot be treated by hypothetical years.[3]

Data by States and years as supplied by the agencies, indicate that the number of permits at the end of the report period was not significantly greater or smaller than at the beginning. However fluctuations within the period were common. North Dakota is a case in point (Table B5, Vol. III, p. 294). In 1967, there were 285 permits; in 1964, only 58; in 1961, 319; and in 1958, 108. Other States had fluctuations but not to this extreme.

Acreages also fluctuated within the period. However, there seemed to be only slight changes, if any, in permitted acreage through the reported years as a whole. Since the number of permits and the acreages remained about the same, there is no reason to believe that a change occurred in average permit size.

Average rent per acre has been generally increased over the years by some agencies like the Bureau of Reclamation and the Department of Defense. Rents of other agencies have fluctuated to the extent that no conclusion could be reached. One extreme example of an increase occurred on Navy lands in Arizona where the average rent per acre was $57.00 in 1966 and 1967 but $180.00 in 1968 (Table B11, Vol. III, p. 318). Other increases were on lands in the Lower Colorado River Land Use project where the average rents per acre for Arizona and California were $.78 and $.54 respectively in 1957, and steadily increased until 1966 when they were $8.35 and $5.43, respectively. Such increases may help explain the reluctance of trespassers to seek permits (Tables B2, B3, Vol. III, pp. 265-66).

Data from the Navy, only agency to report major crops, indicates that high value and high intensity crops tend to have the highest returns per acre. A permittee growing lemons in Arizona paid a rent of $180.00 an acre, and rent of several other lemon growing permittees averaged $98.14 per acre in the same State. All these high returns were from irrigated lands. However, not all Navy lands have water available and if not, the rent per acre is lower. For example, Wyoming permittees growing hay paid an average of $.07 per acre. While all dryland is not so dry as Wyoming, rent per acre is not consistently lower. Permittees in New Jersey who grow truck crops on dryland paid an average of $62.50 an acre. Nevertheless, high-value crops and irrigation demanded the premium rents.

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[3] Data supplied by the agencies are in Tables B1-14, Vol. III, pp. 260-334. Tables 3-14 in this volume, pp. 91-102, are summaries of B tables.

While other agencies did not report crops grown or whether land was irrigated or not, a look at total rents paid per acre indicates that generally high rents were paid in States usually thought of as having heavy rainfall or where irrigation is the most practical means of growing a crop. California and New Mexico, two States that rely extensively on irrigation, charged $27.22 and $14.71 an acre, respectively, for reclamation lands (Table 3). Rents in the dryland States of North Dakota, Montana, and Colorado averaged $1.32, $.94, and $2.01 an acre, respectively.

An examination of the data supplied by the Department of Defense also reveals a close relation between high rents and land capacity. California had the highest average rent per acre, $52.00 for Air Force lands. In New Jersey an average rent per acre of $21.53 was paid for Army (Military) lands and in New Hampshire, $69.21. In general, the highest average rent per acre for Army lands were in the Eastern States. Rentals in dryland States were $.67 an acre for Army (Military) lands in South Dakota, $.98 for Air Force land in Oklahoma, and $1.01 in South Dakota for Army (Civil Works) acres.

Since information on irrigation and crops is lacking, the extremes in rent within an agency and among agencies within a State are inexplainable. The diversity within agencies can be seen in Table 11, where rents range from a low average of $.51 in Florida to the $69.21 already mentioned for Army (Civil Works) lands in New Hampshire. Disparities within a State are illustrated by Florida with a range from $.51 for Army (Civil Works) lands to $81.60 an acre for National Aeronautics and Space Admininstration lands.

SUMMARY AND CONCLUSIONS

During the last seventy years many laws and regulations have been developed to permit and regulate various private uses of the public lands, including those for intensive agriculture. These are administered by several agencies.

Since the information supplied by the responsible agencies was inadequate and incomplete, the plan to classify and tabulate acreages, rates, and revenues by crops produced on irrigated and drylands for the various agencies and all 48 contiguous States had to be curtailed. A more limited tabulation and analysis were prepared; from this process only a few conclusions can be drawn, and these must be considered tentative.

The device of hypothetical permit years was utilized, and additional, actual, fragmentary data reported were scrutinized closely. For the period studied, approximately 8,273 permits were issued on 1,010,064 acres. These permits returned $5,656,951 for the hypothetical year. The Department of Defense had the largest number of permits and acreage as well as the largest amount of revenue. Within that department Army (Civil Works) issued the largest number of permits and acres and had the largest total revenue. The smallest number of permits was granted by the Bureau of Land Management. It also had the smallest permitted acreage. Kansas had the largest number of permits granted while Oklahoma had the largest permitted acreage.

While the number of permits varied from State to State and agency to agency, and also fluctuated within the period studied, there was no major change over the years. No significant variation in total permitted acreages occurred, and there appeared to be no change in permit size--as the permits fluctuated, so did the acreage.

Revenue from permits increased during the study period in a large number of States. Some States experienced a drastic increase while in others, revenue increased less, remained constant, or decreased; however, large fluctuations in rent were evident within agencies and States as well as from State to State and agency to agency.

From the limited data on crops, the indications are that high value crops return the largest rents and that irrigated lands also increase rent per acre. A combination of irrigation and high value crops would seem to return the largest rents; however, due to the lack of information on land capabilities it is difficult to draw a firm conclusion.

Table 1.--Average numbers and acreages of permits, total rents, and rents per acre for hypothetical year in 48 contiguous States, by agencies

Agency and period reported	Number	Total permit acreage	Acreage per permit	Total rent	Rent per acre
	- - - - - - - - - -	-Average per year - -	- - - - - - - - - -		
U.S. Dept. of Agriculture					
Forest Service, 1957-1966 (alt. yrs.)	1,188	17,094	144	NA	$1 to 15.00
Dept. of Defense (total)	(5,104)	(839,483)	(164)	$(2,580,722)	(3.07)
Army (Military), 1966-1968	399	168,804	423	486,535	2.88
Air Force, 1966-1968	91	15,821	174	70,331	4.44
Army (Civil Works), 1966-1968	4,498	572,045	127	1,884,922	3.29
Navy, 1966-1968	116	82,813	713	138,884	1.68
Dept. of the Interior (total)	(1,403)	(179,296)	(128)	----	----
Reclamation, 1957-1966	289	35,069	121	549,108	15.66
Lower Colorado River LU land (Yuma, Arizona), 1957-1968	70	5,388	77	24,955	4.63
Lower Colorado River LU land (trespasses), 1957-1966	15	2,950	197	NA	NA
National Wildlife Refuge Farming, 1957-1966	581	111,851	193	649,852	NA
National Wildlife Refuge Haying, 1957-1966	361	20,162	56	51,443	NA
National Park Service 1966	66	3,551	54	796,376	3.16
Bureau of Land Management, 1968	21	325	15	NA	NA
National Aeronautics and Space Administration, 1966-1968	72	3,444	48	265,458	77.07

Table 2.--Numbers of intensive agricultural permits with total acreages and rentals for all agencies, by States, for a hypothetical year during the period 1957-1968

17 Western States	Number permits	Annual acreage	Annual rent[a]
	----------------	---per year---	----------------
Arizona	101	6,091	$ 15,795
California	449	58,871	1,557,858
Colorado	72	5,815	32,384
Idaho	58	2,839	21,649
Kansas	708	111,754	397,474
Montana	157	12,733	37,132
Nebraska	136	27,184	404,909
North Dakota	579	60,288	152,957
New Mexico	31	2,337	15,984
Nevada	14	8,241	5,859
Oklahoma	580	128,885	248,198
Oregon	67	8,655	77,732
South Dakota	275	51,287	83,584
Texas	359	91,166	147,800
Utah	25	1,837	3,855
Washington	48	3,949	37,649
Wyoming	67	14,748	26,839
Sub-total	3,726	596,680	$3,267,658
(Average permit size--160 acres)			
31 Eastern States			
Alabama	118	28,572	$ 90,555
Arkansas	314	35,594	94,827
Delaware	2	730	10,835
Connecticut	9	425	1,025
Florida	83	4,802	279,079
Georgia	70	5,924	13,749
Illinois	334	27,574	213,380
Indiana	134	18,780	78,813
Iowa	352	46,622	444,094
Kentucky	138	9,797	51,317

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[a] See footnote at end of table.

Table 2.--Numbers of intensive agricultural permits with total acreages and rentals for all agencies, by States, for a hypothetical year during the period 1957-1968, continued

	Number permits	Annual acreage	Annual rent[a]
	-----------------	per year	-----------------
Louisiana	34	1,141	$ 6,085
Maine	3	386	3,620
Maryland	9	1,718	25,297
Massachusetts	5	348	1,517
Michigan	44	3,317	26,233
Minnesota	18	820	2,989
Mississippi	619	58,249	198,759
Missouri	525	82,214	285,671
New Hampshire	25	1,477	101,992
New Jersey	4	725	2,202
New York	30	2,372	26,915
North Carolina	139	3,243	119,669
Ohio	72	14,071	20,487
Pennsylvania	68	8,630	10,903
Rhode Island	0	0	0
South Carolina	655	4,752	32,352
Tennessee	464	40,224	155,070
Vermont	11	322	1,468
Virginia	117	5,152	26,838
West Virginia	36	187	---
Wisconsin	97	5,216	53,552
Sub-total	4,547	413,384	$2,389,293
(Average permit size--91 acres)			
Grand total	8,273	1,010,064	$5,656,951
(Average permit size--122 acres)			

[a] Excludes revenues from LU trespasses in Arizona and California, Forest Service special use permits and Bureau of Land Management because of missing data--no average revenue calculated because of missing data.

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able 3.--United States Department of the Interior: Agricultural leases on reclamation withdrawn land, 1957-1966

tate (no data vailable for mitted States)	Total number annual leases	Total acreage	Total rent	Average annual fee per acre
rizona	7	490	$ 800	$ 1.63
alifornia	1,857	1,764	4,803,728	27.22
olorado	7	803	1,612	2.01
daho	77	4,320	24,754	5.73
ontana	217	27,545	26,018	.94
ebraska	32	1,200	5,600	4.67
evada	1	5,677	275	.05
ew Mexico	10	380	5,591	14.71
orth Dakota	3	513	678	1.32
regon	185	59,590	578,162	9.70
tah	27	1,236	1,626	1.32
ashington	13	195	1,617	8.29
yoming	453	72,254	40,617	.56
Total	2,889	350,686	$5,491,078	$15.67

Source: See Bibliography, Part IIC, at end of volume.

able 4.--United States Department of the Interior: Lower Colorado River Land Use Office (Yuma, Arizona), 1957-1966

tate (no data vailable for mitted States)	Total number annual permits	Total acreage	Total rent	Average annual fee per acre
rizona	341	22,514	$142,236	$6.42
alifornia	360	31,368	107,310	3.42
Total	1,006[a]	136,811[a]	$249,546	$1.78

Source: See Bibliography, Part IIC, at end of volume.

[a] Includes 154 trespasses involving 29,498 acres in Arizona and 251 respasses involving 53,431 acres in California.

Table 5.--United States Department of the Interior: Fish and Wildlife Service National Wildlife Refuge Farming Program, 1957-1966

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent[a]
Alabama	698	73,307	$ 656,374
Arizona	0	2,160	7,370
Arkansas	90	32,879	468,481
California	158	219,392	6,859,541
Colorado	0	8,164	218,780
Delaware	23	6,800	104,820
Florida	0	7,619	86,234
Georgia	22	10,403	98,833
Idaho	44	7,213	155,088
Illinois	661	84,788	713,835
Iowa	114	20,983	305,821
Kansas	126	28,771	366,428
Kentucky	160	19,971	373,061
Louisiana	15	2,460	51,657
Maine	0	894	15,562
Maryland	3	9,147	204,376
Massachusetts	0	1,859	13,600
Michigan	222	28,706	351,753
Minnesota	19	4,992	26,983
Mississippi	129	26,118	233,357
Missouri	360	76,165	1,178,029
Montana	258	36,266	285,257
Nebraska	10	390	17,208
Nevada	1	3,132	33,767

See footnote at the end of the table.

Table 5.--United States Department of the Interior: Fish and Wildlife Service National Wildlife Refuge Farming Program, 1957-1966--continued

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent[a]
New Jersey	1	767	$ 5,022
New Mexico	7	19,917	153,809
New York	10	1,709	15,716
North Carolina	47	9,557	98,810
North Dakota	1,002	103,092	633,802
Ohio	16	1,934	10,088
Oklahoma	6	2,239	4,361
Oregon	35	16,400	193,316
Pennsylvania	13	574	5,921
South Carolina	89	22,782	317,222
South Dakota	293	44,539	418,534
Tennessee	726	75,586	753,145
Texas	76	25,647	95,649
Utah	0	697	13,527
Vermont	1	907	7,419
Virginia	0	2,944	93,555
Washington	12	16,408	223,109
Wisconsin	362	21,681	403,908
Wyoming	0	38,549	225,435
Total	5,809	1,118,508	$6,498,518

Source: See Bibliography, Part IIC, at end of volume.

[a] Figures represent composite of bushels ($1.50) and tons ($22.00) prices for both harvested and unharvested government share.

Table 6.--United States Department of the Interior: Fish and Wildlife Service National Wildlife Refuge Haying Program, 1956-1966

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent[a]
Alabama	4	48	$ 176
California	69	20,731	176,488
Colorado	121	19,215	58,662
Delaware	4	152	---
Georgia	4	40	43
Idaho	105	10,667	36,653
Illinois	70	3,898	2,924
Iowa	2	97	183
Kansas	158	9,661	18,094
Kentucky	5	252	44
Maine	24	228	315
Massachusetts	29	950	950
Michigan	143	3,328	10,583
Minnesota	74	1,650	2,083
Mississippi	26	338	599
Missouri	31	523	1,080
Montana	346	52,973	53,345
Nebraska	231	15,865	7,511
Nevada	2	4,540	6,181
New Jersey	6	207	---
New Mexico	3	116	441
New York	39	1,010	2,809
North Dakota	1,013	53,655	91,139
Ohio	12	487	525
Oklahoma	1	160	---
Oregon	23	2,251	3,113
Pennsylvania	69	1,131	3,689
South Dakota	117	4,649	8,078
Tennessee	50	1,279	453
Texas	13	600	1,362
Utah	9	320	2,929
Vermont	63	1,633	6,277
Washington	96	4,675	15,707
Wisconsin	198	5,666	1,999
Total	3,161	201,624	$514,435

Source: See Bibliography, Part IIC, at end of volume.

[a] Figures represent composite of bushels ($1.50) and tons ($22.00) prices for both harvested and unharvested government share.

Table 7.--United States Department of the Interior: National Park Service, 1966

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent	Average annual fee per acre
Minnesota	1	55	$ 83	$1.51
Nebraska	26	1,509	5,408	3.58
North Dakota	38	1,981	5,724	2.89
South Dakota	1	6	18	3.00
Total	66	3,551	$11,233	$3.16

Source: See Bibliography, Part IIC, at end of volume.

Table 8.--United States Department of the Interior: Bureau of Land Management, 1968

State (no data available for omitted States)	Total number permits	Total acres
Idaho	1	29.57
Montana	8	120.00
Utah	2	75.00
Wyoming	10	100.00
Total	21	324.57

Source: See Bibliography, Part IIC, at end of volume.

Note: No rental data available.

Table 9.--United States Department of Agriculture: Forest Service special use permits, alternate years 1957-1965

State (no data available for omitted States)	Total number annual permits	Total acreage	Annual fee per acre[a]
Alabama	73	514	$2.00 - $ 8.00
Arizona	253	3,093	1.00 - 5.00
Arkansas	155	3,167	1.50 - 10.00
California	416	1,935	2.50 or 7% of land value whichever is greater
Colorado	215	3,375	1.00 - 5.00
Florida	39	1,149	3.00 - 15.00
Georgia	158	1,581	1.00 - 6.00
Idaho	173	2,949	1.00 - 5.00
Illinois	238	3,471	1.00 - 11.00
Indiana	147	970	1.00 - 11.00
Kentucky	23	82	Not available
Louisiana	154	1,525	1.00 - 6.00
Michigan	41	567	1.00 - 11.00
Minnesota	41	507	1.00 - 11.00
Mississippi	365	6,644	1.00 - 10.00
Missouri	411	4,640	1.00 - 11.00
Montana	330	3,566	5.00 permit or 1.00 per acre
Nevada	21	157	2.00 - 5.00
New Hampshire	16	13	1.00 - 11.00
New Mexico	148	1,474	$1.00 - $ 5.00
North Carolina	471	3,104	1.50 - 7.50
North Dakota	132	9,057	5.00 permit or 1.00 per acre
Ohio	147	970	1.00 - 11.00
Oregon	208	3,579	1.00 - 15.00
Pennsylvania	44	72	1.00 - 11.00
South Carolina	454	10,452	3.00 - 8.00
South Dakota	232	5,612	1.00 - 5.00
Tennessee	144	1,376	4.00 - 8.00
Texas	167	2,664	1.00 - 10.00
Utah	87	1,571	2.00 - 5.00
Vermont	15	62	1.00 - 11.00
Virginia	21	92	Not available
Washington	94	483	1.00 - 15.00
West Virginia	178	935	Not available
Wisconsin	78	888	1.00 - 11.00
Wyoming	54	3,176	1.00 - 5.00
Total	5,943	85,472	

See footnotes at the end of the table.

Source: See Bibliography, Part IIC, at end of volume.

Note: Rental data not available.

[a] Only ranges of cost per acre available.

Table 10.--Department of Defense: Army (Military), 1966-1968

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent	Average annual rent per acre
Alabama	79	60,690	$ 69,906	$ 1.15
Arkansas	8	1,125	3,249	2.89
California	11	3,484	29,700	8.52
Georgia	2		630	
Illinois	204	36,844	230,001	6.24
Indiana	187	40,974	159,045	3.88
Iowa	91	22,800	298,834	13.11
Kansas	138	60,536	135,032	2.23
Kentucky	19	5,398	4,347	.81
Maryland	20	1,207	13,050	10.81
Mississippi	9	5,808	4,818	.83
Missouri	3	3,657	15,363	4.20
Montana	1	667	2,011	3.01
Nebraska	36	45,364	147,205	3.24
New Jersey	3	65	1,400	21.53
New York	3	54	210	3.89
North Carolina	3	1,296	2,100	1.62
North Dakota	2	180	254	1.41
Ohio	52	33,269	21,344	.64
Oklahoma	33	39,114	51,251	1.31
Oregon	4	240	453	1.89
Pennsylvania	57	20,419	19,836	.97
South Dakota	5	43,733	29,435	.67
Tennessee	139	65,264	164,466	2.52
Texas	6	3,521	10,895	3.09
Utah	6	3,657	6,183	1.69
Virginia	3	230	---	---
Washington	3	453	456	1.01
Wisconsin	71	6,365	38,282	6.01
Total	1,198	506,414	$1,459,756	$ 2.88

Source: See Bibliography, Part IIC, at end of volume.

Table 11.--Department of Defense: Army (Civil Works), 1966-1968

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent	Average annual rent per acre
Alabama	3	429	$ 300	$ 0.70
Arkansas	814	93,894	140,690	1.50
California	168	29,281	291,620	9.96
Colorado	47	6,968	13,439	1.93
Connecticut	26	1,275	3,084	2.42
Delaware	1	106	1,060	10.00
Florida	2	130	66	.51
Georgia	104	13,203	8,362	.63
Illinois	434	17,038	193,866	11.38
Indiana	127	12,407	75,735	6.10
Iowa	928	110,599	941,304	8.51
Kansas	1,844	227,220	898,397	3.95
Kentucky	337	17,881	37,673	2.11
Maryland	2	2	10	5.00
Massachusetts	7	202	186	.92
Mississippi	1,581	156,915	521,512	3.32
Missouri	1,206	217,056	487,084	2.21
Nebraska	205	24,534	114,661	4.67
New Hampshire	65	4,421	305,976	69.21
New Jersey	3	1,800	2,700	1.50
New York	29	3,090	3,718	1.20
North Carolina	144	3,594	8,141	2.27
North Dakota	784	121,315	220,350	1.82
Ohio	39	2,421	10,753	4.44
Oklahoma	1,684	282,928	660,714	2.34
Oregon	6	105	525	5.00
Pennsylvania	86	4,639	5,699	1.23
South Carolina	14	1,008	1,100	1.09
South Dakota	554	92,050	93,280	1.01
Tennessee	931	30,356	70,086	2.31
Texas	931	225,309	500,670	2.22
Vermont	6	168	294	1.75
Virginia	266	11,132	21,360	1.92
Washington	25	2,647	20,232	7.64
Wisconsin	3	12	120	10.00
Total	13,406	1,716,135	$5,654,767	$ 3.29

Source: See Bibliography, Part IIC, at end of volume.

Table 12.--Department of Defense: Air Force, 1966-1968

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent	Average annual rent per acre
Alabama	2	888	$ 206	$ 0.23
California	2	20	1,040	52.00
Illinois	3	152	1,247	8.20
Indiana	2	2,366	1,650	.70
Iowa	5	143	346	2.42
Kansas	51	31,828	141,746	4.45
Louisiana	2	954	1,940	2.03
Maryland	1	36	180	5.00
Missouri	2	142	833	5.87
Nebraska	9	1,894	27,544	14.54
New York	2	68	160	2.35
North Dakota	156	1,750	3,407	1.95
Ohio	26	4,930	26,168	5.31
Oklahoma	2	806	790	.98
Tennessee	1	232	1,350	5.82
Texas	1	610	1,269	2.08
Washington	5	135	638	4.73
Wisconsin	1	520	480	.92
Total	273	47,465	$210,994	$4.45

Source: See Bibliography, Part IIC, at end of volume.

Table 13.--United States Department of Defense: Navy, 1966-1968

State (no data available for omitted States)	Number	Total acreage		Total rent[a]		Average annual rent per acre	Major crop
		Irrigated	Dryland	Irrigated	Dryland		
Alabama	3	---	806	---	3,591	$ 4.45	field crops
Arizona	3	21	---	2,061	---	98.14	lemons
California	107	52,947	46,920	559,155	207,941	7.68	truck crops
Florida	7	---	1,094	---	15,920	14.55	citrus
Georgia	3	---	489	---	2,596	5.30	pecans
Kansas	3	---	4,152	---	11,832	2.84	hay
Louisiana	2	---	816	---	816	1.00	hay
Maine	3	---	822	---	6,100	7.42	berries
Maryland	3	---	1,164	---	1,338	1.14	field crops
Nevada	31	11,328	9,300	52,986	2,325	2.68	truck crops
New Jersey	2	---	16	---	1,000	62.50	truck crops
New York	39	---	3,087	---	71,101	23.03	truck crops
North Carolina	2	---	102	---	112	1.09	hay
Oklahoma	18	---	63,088	---	30,533	0.48	hay
Pennsylvania	10	---	283	---	4,294	15.17	truck crops
South Carolina	6	---	144	---	778	5.40	truck crops
Tennessee	4	---	392	---	3,532	9.01	hay
Texas	10	---	34,575	---	1,563	0.04	row crops
Virginia	70	---	6,150	---	31,089	5.05	field crops
Washington	19	---	1,943	---	19,488	10.02	field crops
Wyoming	4	---	8,800	---	703	0.07	hay
Total	349	64,296	184,143	614,202	416,652		

Source: See Bibliography, Part IIC, at end of volume.

[a] Rent does not include costs of water and soil conservation or grounds maintenance ($788,880 annual average) assumed by lessee.

Table 14.--National Aeronautics and Space Administration, 1966-1968

State (no data available for omitted States)	Total number annual permits	Total acreage	Total rent	Average annual rent per acre
Alabama	4	585	$ 996	$ 1.70
Florida	216	9,747	795,380	81.60
Total	220	10,332	$796,376	$77.08

Source: See Bibliography, Part IIC, at end of volume.

PART III

EFFECTS OF THE EXISTING SYSTEM

A. Proof Requirements in Relations to Policy Objectives and Economics Effects.

B. Economics of Farm Size in the Western United States.

The existing system of policies, laws, regulations and practices has accumulated upon and around the earlier acts intended to settle the public lands with farm families. Conditions have changed, but various restrictions and requirements remain.

What have been the effects of these various requirements upon applicants and administrative agencies in recent years?

Do the restrictions on size of the tracts which may be acquired under the disposal acts bear any relationship to the units needed for efficient farm businesses?

These and related questions are treated in this part.

A. PROOF REQUIREMENTS IN RELATION TO POLICY OBJECTIVES AND ECONOMIC EFFECTS

The Homestead Act of 1862 was an expression of the national policy with regard to the public domain. The act provided for transfer of public land to private ownership and for its use for intensive agriculture under independent farm family operation. Amendments and some more recent laws have retained the same emphasis. A body of requirements and regulations has been developed to guide the applicants in "proving up" their claims and the administering agencies in determining the adequacy of those proofs. In addition, attitudes have been acquired relative to the manner and degree of observance and enforcement of the requirements and regulations.

Now, approximately 100 years after enactment of the first of the Homestead Acts, it is possible to measure the results with some degree of objectivity against stated or assumed objectives and to consider the part played by proof requirements. However, allowance must be made for changes which have occurred over time. Public lands suitable for intensive agriculture have become relatively scarce. The numbers of people eager to settle and develop new lands have decreased as alternate opportunities improved. Agriculture has become more commercialized requiring larger business units. There have been increasing pressures for use of public lands for non-intensive agriculture and non-agricultural purposes.

The stated or implied objectives of homestead policies have included:

Transfer of public lands to private ownership (for a variety of reasons).
Settlement (occupancy) of the new lands by farm operating families (also for a variety of reasons).
Development and productive use of these lands, principally for intensive agriculture to produce food and fiber.
Stimulation of economic activity in the community or area.
Obtaining revenue for the federal government from disposals of public lands.

The categories of proof requirements particularly relevant to this discussion include: occupancy; cultivation and improvements; time limitations (prescribed and actual); acreage limitations; and others such as fees, miscellaneous costs, and "paperwork." How well have the various homestead laws and regulations performed in attaining these objectives? To what extent have these proof requirements assisted or hampered the efforts of the settlers or the administrators? Considerable

evidence in answer to such questions is presented in Part II, A and B, of this report and in "Report of the Legal Study of Federal Public Land Laws and Policies Relating to Intensive Agriculture" by Kronick and others. A recapitulation of some of this evidence according to the above listed objectives and categories of proof requirements follows.

Transfer of Public Lands to Private Ownership

The evidence of quantities of land transferred is definite. Slightly over one billion acres were conveyed to private ownership during the period 1781-1966, but less than 24 million acres of this total (about 2 percent) were transferred in the 1934-1966 period. Within the overall total only about 300 million acres (roughly 30 percent) were granted or sold to homesteaders. However, between 1934 and 1966 when the total conveyed was only 24 million acres, the homestead-type acts accounted for one-half of the transfers, largely in the 17 Western States. Nationally, the trend in original land entries was generally upward from 1862 until a peak was reached in 1910. After that, the trend was sharply downward until 1940 with comparatively little activity since then. In the peak year 1910, homestead entries embraced about 23 million acres. This compares with an average of 500,000 acres per year for the period, 1934-1966.

The conclusions are obvious--in earlier periods this objective was attained, but in recent years there have been relatively few transfers to private ownership and relatively little use of the Homestead and Desert Land Acts provisions (See "Disposal of Public Lands," Volume III). Reasons for these declines seem to be numerous and include the changes mentioned above. In addition, evidence from case studies given in Part IIB seems to indicate that procedures and requirements for gaining title have been deterrent during recent years. However, there is no way to isolate and measure the effects of individual requirements.

Occupancy requirements seem to be less well suited to modern agriculture in the Western States than to earlier agriculture farther east. Cultivation and improvement requirements call for, or permit, a piecemeal approach ill adapted to development of modern farms. In some areas at least, acreage restrictions seem to set limits below an adequate size for efficient operation. The actual time necessary to obtain patent has averaged much longer than legal minimums. There has been a great volume of paperwork, and the process has been costly for both the applicant and for the government. Certainly, it must be assumed that all of these factors have tended to reduce transfers. Less than 15 percent of applicants who tried to obtain public lands in recent years were successful in gaining entry and only half of these obtained patents. There is no way of knowing the numbers who did not apply.

Settlement (occupancy) of the new lands by farm operating families

The original Homestead Act of 1862 required an application to be made for the purpose of actual residence on property claimed. Subsequent modifications and other acts, such as Desert Land and Reclamation, altered or did not require this residence. The original act did foster actual residence although there were many abuses which circumvented the intent of the law. In the 1880s the number of farm units created under the Homestead Act reached a peak during a time of rapid development in the Midwest. Since then, the movement has been westward and declining. particularly between 1934 and 1966.

Indications of length of occupancy after obtaining patent were derived from a study of the disposal and use experience of a selected number of patented entries in 11 Western States. The study shows that patentees tend to dispose of much of the patented land relatively soon after patent. About one-half of those receiving patents between 1950 and 1963 had disposed of all their patented land by the end of 1968, and therefore, these no longer reside on the patented land. Some of the new owners, often earlier patentees, may take up residence on the patented tract, but the evidence is that purchased patented lands become parts of larger established units, especially for desert land and enlarged homestead entries.

Among homestead patented entries requiring residency, 11 of 21 entries selected and studied were idle in 1968--at least they had no farm income. Even many of those remaining active had operators who no longer lived on the unit. This is understandable since improved roads and means of transportation have made it possible for the owner or operator to live in town or on another detached unit. Furthermore, about four-fifths of the units derived their income from crops involving only seasonal work, another factor making off farm residency possible and often more desirable in terms of available schools and other facilities.

Do proof requirements concerning term of occupancy or the costs of complying with this requirement cause difficulties for entrants or serve to inhibit settlement? Evidence from case studies and other sources indicates that time extensions were requested rather frequently because of illness in the family or for other personal or financial reasons. No evidence was obtained concerning any possible deterrent effects on people who did not file applications for entry.

Development and Productive Use of These Lands Principally for Intensive Agriculture to Produce Food and Fiber

This developmental objective has two major aspects: (1) preparation and use of the land, and (2) the construction of improvements such as houses, barns, storage facilities and similar projects. The following information on improvements came from a study of entries patented during the 1950-63 period in the 11 Western States.

Value of Improvements on Patented Entries

Reclamation entries lead all other types in the value of improvements on both a per tract (27,000) and per acre ($206) basis. This compares with $20,000 and $97 respectively, for desert land entries; $13,000 and $97 for homestead ordinary entries; and about $4800 and $21 for homestead enlarged patented entries.

Improvements on reclamation lands are primarily related to preparing the tracts for irrigation, meaning large investments in items like leveling, ditching, and pipelines. Such improvements are also important to desert land entries, but in addition, residences and general farm buildings appear to be more generally found on this latter type.

Ordinary homestead entries have a rather high average amount of improvements. For this type of entry, the entryman must establish residence and live on the tract a specified period to earn patent. If successful, he may make a heavy investment in a house before or after patent. Even if he should fail and the tract become idle, perhaps abandoned, it still has sizable value of improvements reported with the residence accounting for a large proportion.

The homestead enlarged patented entries tend to have few improvements since many operators do not reside on the land and their agricultural activities are of the less intensive type. There are exceptional instances of successful entrymen who reside on the original patented tract and who have acquired additonal land and made many improvements. In such cases, improvements often include a substantial residence, storage facilities, fences, and general farm buildings.

A considerable proportion of the land, especially homestead ordinary tracts recently patented, becomes idle relatively soon after patent. For example, 11 of 21 homestead patented entries studied were idle at the end of 1968 while 4 of 19 desert land entries, 1 of 24 enlarged entries, and 7 of 42 farm units containing reclamation patented entries were also idle.

Crops are the principal source of farm income for units containing the patented acres, all types. This is in accordance with the intent of the laws. Based on patented entries for which information is available, the approximate percentage of gross farm income from crops for each type is: reclamation, 95 percent; homestead ordinary, 80 percent; homestead enlarged, 75 percent; and desert land, 60 percent.

Production of Foods, Fibers, and Other Products

In general, patented acres are used for various forms of intensive agriculture, although some have become parts of farm units whose major source of income is livestock production. This is particularly true of some desert land and homestead enlarged type acreage.

Reclamation patented acres tend to be used almost exclusively for highly intensive crops such as citrus, potatoes, and sugar beets. Few reclamation acres are idle, especially compared with homestead ordinary patented acres. Many of the latter type are part of patented trades which have been temporarily or even permanently abandoned. To a considerable degree this idleness accounts for the low average income per farm unit (about $2,600) to which homestead ordinary patented acres belong.

Related to the kind and volume of production is size of the farm. For example, in southwest Colorado and southeast Utah where wheat is a major crop, wheat acreage allotments become a consideration in acquisition of land. Furthermore, in many instances, it is necessary to summer fallow in alternative years to conserve meager water supplies. This need encourages and requires enlargement of farms and is one of the important influences on the kind of crop grown.

There is a strong tendency of owners to acquire more land as additions to existing farm units. The increase over the patented entries in the size of farm units to which patented land belongs was only moderate for the reclamation type, from 131 to 150 acres. For ordinary homesteads the increase in farm size was much more substantial, from 128 to 200. For enlarged homesteads the increase over the patented acreage was tenfold, from 199 to 1,948 acres. The desert land type also increased very sharply--about 8 times--from 221 to 1,719 acres.

The enlargement occurs through the addition to the original entry of other land by the owners of the patented tract, or by adjacent operators who add the patented acres to an existing unit. The latter is the more common practice. In reclamation entries this trend is offset partly by the break up of some entries into smaller tracts in areas of very intensive agriculture, as in the production of citrus. And for homestead ordinary entries, the upward trend in size of unit is minimized by a high proportion of idle, or nearly inactive, patented entries that tend to remain constant in size.

The data indicate that the acreage limitation of 320 acres per entry imposed by the Desert Land and Enlarged Homestead Acts is unrealistically low. This conclusion is supported by farm income data showing that entries which have not become part of larger units have nominal productive capacity and therefore develop relatively little income (See Part III B).

Time, cultivation, and improvement requirements in combination have caused real difficulties for many entrants. Delays, additional costs, and much paperwork have resulted. These are all documented in the case studies and noted in several other references. Undoubtedly, the problems were related to the lack of capital resources of the settlers and to the initial low earning power of the new farm units, particularly where acreage limitations applied. Undoubtedly also, anticipation of such difficulties has been a deterrent to potential entrants.

Stimulation of Economic Activity in the Community or Area

There seems little doubt that additional homesteading does have an upward impact on the immediate community, at least in the short run. There is considerable historical evidence that in areas of marginal lands which were homesteaded, such economic gains were short lived because of failure on the part of homesteaders. Even so, some communities survived due to the development of other activities like mining and tourism.

In some areas and in many individual instances, operators of patented lands do make a very substantial contribution to the economic life of the community through the production of salable products, local spending of farmers, and development of local agri-business. Evidence of this is available from information on 1968 gross farm incomes showing the following averages per unit by type: reclamation, about $15,000; homestead ordinary, $2,636; desert land, $10,430; and enlarged homestead, $21,008. The latter included one unit having a gross of $159,000 about evenly divided from crops and livestock. The maximum gross for each type of unit was: ordinary homestead land, $11,650; reclamation, $63,000 all from crops; and desert land, $42,500 with $40,000 of this total from livestock.

Obtaining Revenue for the Federal Government from Disposals of Public Lands

The Homestead Acts were intended to settle and develop the lands, not to provide revenue to the federal government, and in actual practice the amounts collected from fees and other payments have been small. During the period 1934-1966 in the 17 Western States, total receipts from fees under Homestead Acts were $835,930 and under the Desert Land Act.

$955,664. These fees represented an average return of $0.12 and $1.32 per acre respectively. In contrast, receipts from land auction sales totalled $14,609,869 or $8.99 per acre.

It seems obvious that direct returns to the federal government from such fees and payments have not equaled administrative costs of the programs. Estimates made by the Bureau of Land Management in 1963, covering 1950-1959 applications under Homestead and Desert Land Acts patented by November 1, 1962, indicated an average administrative cost per patented acre of $26.00.

Summary

The Homestead Acts have been instrumental in conveying a large segment, about 300 million acres, of the public domain into private ownership for intensive agriculture. However, much of the movement was prior to this century, and in recent years the volume has been rather negligible--somewhat under one-half million acres per year.

The acts requiring residency (occupancy) did have the effect of causing people to live on the land, at least long enough to fulfill the residency requirement. In actual practice, many persons left the patented land soon after gaining title, and too often, long before patent was earned. In recent years the tendency is for an increasing proportion of operators of patented land to live elsewhere. Hence, the residency requirement is no assurance that the land will be resided upon permanently by the patentee or his successor.

The requirements that land be cultivated and improved have resulted in cultivation and improvements at least until patents were obtained. However, evidence from case studies indicates that a considerable portion of the land became idle soon after patents were obtained. Difficulties in complying with particular requirements have caused much, maybe most, of the exasperating, costly "paper work" for entrants and for administering agencies.

Homesteading does tend to expand economic activity on a local basis through the purchase of needed supplies and the production of salable crops. The short and long term impacts vary among areas, depending to a great degree on the quality of the land being homesteaded and climatic conditions.

In general, in recent years patented lands have been used for the production of intensive crops in accordance with the intent of the law. Some tracts have become parts of units engaged in important livestock activities, but this has occurred after all obligations under the Homestead Acts have been fulfilled.

Case histories of patented entries show that acreage limits on tracts for homesteading are unrealistically low and hinder successful operations in today's pattern of agriculture. The economies of size are as applicable in the successful development of homesteading tracts as they are to all other farm operations and imply the need for much higher limits to enable the homesteader to take advantage of such economies, thereby improving his chances of success.

B. THE ECONOMICS OF FARM SIZE IN THE WESTERN UNITED STATES

INTRODUCTION

How much cropland is needed to provide farm settlers with an adequate living? The purpose of this study is to help answer this question by a review of some of the more recent budgetary studies of farm size in 17 Western States. However an answer also requires the consideration of some other questions:

What is an adequate income for a farm family? The significance of alternative opportunities, the poverty level of income, and the trends in farm sizes will be explored.

What size of irrigated farm is necessary for an adequate income? What size of dryland farm? Seven studies of irrigated farms in the West and four studies of dryland farms will be reviewed.

As these studies soon make apparent, there is no single size of farm that will provide an adequate income for a farm family. Farm families, like urban families, vary greatly in size and needs, and farms also vary greatly in their capacity to produce any given amount of income.

The question of how much cropland is needed to provide a farm family with an adequate income is important since there are several million acres of federal public lands that might be homesteaded under one or more of the existing Homestead Acts that limit the number of acres which can be acquired by settlers.

The Homestead Acts are a series of statutes enacted by Congress tha provide for the disposal of land to farmers after certain conditions hav been met. The first or original Homestead Act of 1862 provided that a qualified settler could acquire 160 acres of land by living on it and cultivating it for five years. Under certain circumstances this period could also be greatly shortened or commuted by a cash payment.

Apparently it was assumed by Congress that 160 acres of land were sufficient to provide an adequate family living--that 160 acres were, in fact, an economically viable unit. There is no doubt that this was true in much of the Midwest in 1860. But as settlers pushed westward to the 100th meridian and beyond, it became quite clear that 160 acres were not enough to support a family. Hence, Congress repeatedly made efforts to enlarge the size of the homesteads allowed.

The Desert Land Act of 1877 made as many as 640 acres available for development providing the land was satisfactorily irrigated within three years. In 1890 a bill was passed to limit homesteading to 320 acres wes of the 100th meridian, and by 1909 the Enlarged Homestead Act permitted homesteading of 320 acres in certain Western States if the land could nc be irrigated.

In 1904 the Kincaid Act, which applied only to the Sandhills area c Nebraska, permitted 640-acre homesteads. Then, in 1916 the Stock Raisin Homestead Act was adopted. This act permitted settlers to homestead 640 acres in certain Western States where the land could not be irrigated ar was suited mainly for grazing and forage crops.

The Reclamation Act of 1902 permits only 160-acre homesteads on irrigated public lands, and this system continues today. Quite often th apparent intent of the law is circumvented by another member of the same family who takes up an additional 160-acre homestead. Leasing of additional irrigated land is also permitted.

Are these acreage limitations in the public interest? If so, why? If not, why not? What should be the acreage limitations, if any, if the farm family is to have an adequate income? The size of the homestead cc tinues to be a matter of controversy and was frequently mentioned in the public hearings held by the Public Land Law Review Commission in the Western States. Hence, there is little doubt that the Commission will l expected to make recommendations regarding the size of homesteads.

WHAT IS AN ADEQUATE INCOME FOR A FARM FAMILY

An "adequate" income is a matter of definition, and any answer is more or less an arbitrary value judgment. Yet there is some information about costs of family living which should be carefully studied before recommendations can be made with regard to the merits of present limits on farm size. Certainly, one factor affecting the adequacy of any given farm income is the amount that the farmer could make in some alternative employment opportunity that may exist for him.

Alternative Employment Opportunities and Adequate Income

In a competitive free enterprise economy, supply and demand usually determine the price paid for most goods and services, including labor. Agriculture is perhaps the most highly competitive segment of our economy, and farm labor rates for hired men are generally set by competition. But there are still many imperfections in this competition that prevent the determination of the value of a farmer's labor and management. Because he is an independent entrepreneur, his returns for labor and management are largely determined by the amount of his resources and by his skill and good fortune in managing them. Moreover, it is difficult to separate labor from management and profits since there is no direct market price for the farm operator's labor. However, one way this can be done is to assume that the operator's labor is worth at least as much as that of a hired man. Then by subtracting his labor costs as a hired man, the remainder is a return to management or profits. The following example may make this clear:

Gross farm income	$26,000
Cash farm expenses	-8,000
Net cash income	$18,000
Depreciation on machinery and buildings	-4,000
Net farm income	$14,000
Interest on investment in land, buildings and machinery	-10,000
Return to labor and management	$ 4,000
Labor at hired man's rate	3,000
Return to management (profits)	$ 1,000

This example assumes that the farm operator has the alternative opportunity of taking a job as a hired man at $3,000 a year. If so, $3,000 becomes the "opportunity cost" of his labor to the farm business. This amount may also be the farmer's alternative "opportunity returns" and therefore his "reservation price." Unless he can make $3,000 as an independent farmer, he reserves the right to work as a hired man or take a job in town. Some farmers have the ability and training and hence, the opportunity to enter better paying jobs. Therefore, they have higher opportunity costs and probably higher reservation prices.

The foregoing example leaves unanswered the question as to whether or not a hired man's wage is adequate for a farm family. Many would argue that it is not--especially since the poverty line is generally assumed to be $3,000 in current governmental programs, and minimum wage laws are now being applied to farm labor. Certainly a hired man's rate would seem to be the minimum that any government program seeking to help farmers should observe. If the government program does not result in income sufficient to give the operator a hired man's wage for his efforts, it is doubtful whether such a program can possibly be in the public interest. The public interest is generally best served when all resources, including labor and management, are employed in their most productive manner and are compensated accordingly.

The Poverty Line and an Adequate Family Income

The President's Council of Economic Advisors has been using $3,000 as the poverty line of family income for several years. Using this line as a starting point, Madden, Pennock and Jaeger point out that the incomes needed to meet an economy food plan level for families of different sizes and characteristics vary greatly.[1] As shown in Table 1, a family consisting of only husband and wife could escape poverty with an income of $1,244 per year. If the couple has one child under six years of age $3,305 would be sufficient, and the amount needed would decline as the child became older (Types 3 and 4).

Should the poverty line be used as a guide in determining the size of farm a settler is allowed to create on federal public lands? Perhaps the minimum income for farm size determination should be one capable of supporting parents and three or four children with the oldest child over 18 years of age (Types 4 with 5-6 persons). To achieve this income the settler would have to make net returns of $5,200 a year for his labor and management. How large an acreage would be needed to provide this income? As will be shown, the answer varies from State to State and from farm to farm.

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[1] J. Patrick Madden, Jean L. Pennock, and Carol M. Jaeger. "Equivalent Levels of Living: A New Approach to Scaling the Poverty Line to Different Family Characteristics and Place of Residence," in A Report by the President's National Advisory Commission on Rural Poverty, Rural Poverty in the United States, (Washington, D.C.: Government Printing Office, 1968), pp. 545-552.

Table 1.--Family incomes required by type and size of family for economy food plan level in the North Central States, 1968

Family type and size	Farm family	Urban family
Type 1 (husband and wife only)	$1,244	$1,315
Type 2 (oldest child under 6 yrs.)		
3 persons	3,305	3,895
4 persons	3,603	4,232
5 persons	3,754	4,192
6 persons	3,874	4,158
Type 3 (oldest child 6-17 yrs.)		
3 persons	2,623	3,864
4 persons	3,437	4,660
5 persons	3,889	5,040
6 persons	4,215	5,090
7 persons	4,849	5,650
Type 4 (oldest child over 18 yrs.)		
3 persons	2,501	3,365
4 persons	4,243	5,260
5 persons	5,167	6,334
6 persons	5,228	6,138
7 persons	6,358	7,278

Source: President's National Advisory Commission on Rural Poverty, Rural Poverty in the United States, (1968) p. 550.

Recent Trends in Farm Sizes in Western States

Some indication of the size of farm needed to provide an adequate income for a farm family can be secured by a study of farm sizes. In almost all of the 17 Western States the average size of farms has doubled since 1935. In four States the increase has been at least threefold (Table 2). Oklahoma had the smallest average farm size in 1964 with 407 acres. Washington was second with 418 acres and California third with 458 acres. In all the other States the size exceeded 500 acres. In six, the average size exceeded 1,000 acres. In the ranching States of Arizona, Montana, Nevada, New Mexico and Wyoming the farms averaged over 2,000 acres each. The average size in Wyoming exceeded 4,000 acres. In Nevada the average was nearly 5,000 acres and in Arizona over 6,000 acres.

These differences in size in the different States are largely explained by the quality of the land, the use of the land, the number of part-time farmers and similar factors. Land not suited or available for crop production is often used for grazing. The amount of range land needed to support a cow may vary from 10 to 100 acres depending upon its productivity. Thus even a very modest number of cows would call for hundreds or even thousands of acres of grazing land. The kinds of crops grown also affect the size of farm. Dryland crop production requires many acres of land in the Western States to support a farm family.

When the land is irrigated, crops of much greater value can be grown and more labor and management are required per acre. Hence, these farms are usually smaller.

What is an irrigated farm? The U. S. Bureau of the Census includes "all farms reporting any land irrigated." Thus a cattle or sheep ranch with a few acres of irrigated alfalfa is an "irrigated farm," and a 1,000-acre wheat farm that irrigates a few acres of crops is also an irrigated farm. Fully irrigated farms that provide full-time employment for a farm family in the Western States are about the same size as similar farms in the Midwest where the crops produced are comparable. Exceptions exist where fruits or vegetables are involved, or when the climate permits year-round cropping. However, only a small part of the irrigated land in the Western States is used for such intensive crops. Hay and pasture are the two major irrigated crops. The feed grains--sorghum, field corn and barley--are also important crops (Figure 1).

The number of irrigated farms as defined by the Bureau of the Census in the 17 Western States is shown in Table 3. In the Plains States irrigated farms make up only a small percentage of all farms, but in the Rocky Mountain States 60 percent or more of the farms have some irrigated acreage (col. 2).

Of particular interest is the size of these irrigated farms. In only three States do irrigated farms average less than 500 acres: California, 391 acres; Washington, 420 acres; and Idaho, 436 acres (col. 3). However, in only four States does the irrigated land per farm

Table 2.--Average size of farms and percentage of increase in size in the 17 Western States, by States, 1935-1964

State	1935	1950	1964	Increase (percent)
	-----------	acres	-----------	
Arizona	745	3,834	6,262	742
California	202	267	458	126
Colorado	471	833	1,284	173
Idaho	221	328	516	133
Kansas	275	370	544	97
Montana	940	1,689	2,436	159
Nebraska	349	423	596	71
Nevada	980	2,271	4,862	395
New Mexico	831	2,014	3,354	303
North Dakota	462	630	875	92
Oklahoma	166	253	407	145
Oregon	268	340	516	92
South Dakota	445	674	917	106
Texas	275	438	691	151
Utah	203	449	816	302
Washington	174	249	418	168
Wyoming	1,610	2,729	4,100	155

Source: U.S. Department of Commerce, Bureau of the Census, 1964 U.S. Census of Agriculture, vol. 2, chapter 3, p. 250, (figures rounded).

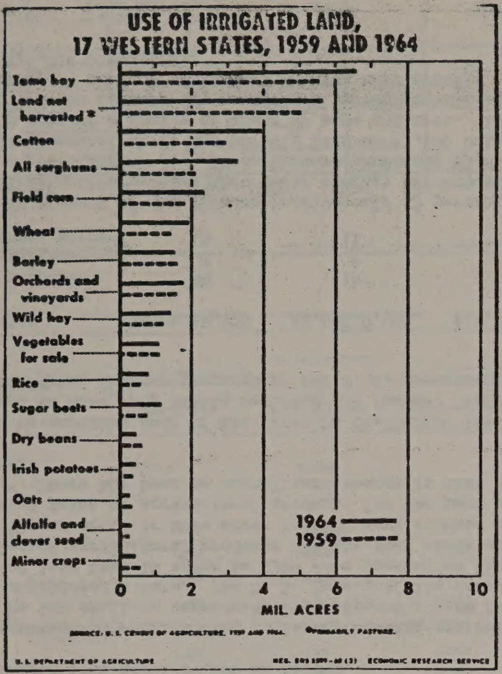

Figure 1

Table 3.--Irrigated farms in the 17 Western States, by States, 1964

State	Irrigated farms		Size of irrigated farms--acres	Irrigate land pe farm--acr
	Number	Percent of all farms		
North Dakota	442	0.9	1,791	114
South Dakota	1,005	2.0	2,166	129
Nebraska	18,833	23.5	639	115
Kansas	5,102	5.5	1,186	197
Oklahoma	26,673	3.0	889	113
Texas	27,114	13.2	1,097	236
Montana	10,843	40.1	2,349	175
Idaho	22,251	75.0	436	126
Wyoming	5,923	65.5	3,510	265
Colorado	18,317	61.5	1,052	147
New Mexico	8,274	58.2	1,738	98
Arizona	4,697	72.5	4,706	240
Utah	13,762	87.3	747	79
Nevada	2,018	93.6	3,797	409
Washington	16,488	36.2	420	70
Oregon	15,869	39.9	840	101
California	59,429	73.5	391	128

Source: _1964 U.S. Census of Agriculture_, vol. 2, chap. 9, pp. 91
916.

Note: An irrigated farm is defined as a farm with any portion of its acreage under irrigation.

exceed 200 acres. These are Texas, Wyoming, Arizona and Nevada. In almost all of the other States the average number of acres irrigated is less than 160. To some extent this may reflect the 160-acre limitation imposed upon all users of water supplied to federal irrigation projects.

Farm Income Estimates and Size of Farms

Another clue to what might be considered an adequate farm income is provided by average farm income estimates of the U. S. Department of Agriculture reproduced as Table 4. Presented are the realized gross farm incomes which include sales, government payments and non-monetary returns, and net incomes for the 48 contiguous States. Note particularly the variability in these incomes. Utah had the lowest net income per farm with only $2,923 in 1967. In contrast, California had nearly $12,000 and Arizona nearly $24,000. In most of the Western States the net incomes ranged from about $4,000 to $6,000.

It is important to realize that a place producing agricultural products can be too small or unproductive to support a farm family but still may be considered a farm. The U. S. Bureau of the Census states that "places of less than 10 acres in 1964 were counted as farms if the estimated sales of agricultural products for the year amounted to at least $250. Places of 10 or more acres in 1964 were counted as farms if the estimated sales of agricultural products for the year amounted to at least $50." There has been no significant change in this definition for many years.

As might be expected many of the farms in the United States produce very little and so have very little realized net income. This can be seen in the following figures prepared by the U. S. Department of Agriculture.[2]

Farms with sales	Under $5,000	$5,000-9,999	$10,000 and over
All farms, percent	54	14	32
All sales, percent	7	8	85
All net income, percent	15	11	74

Because 54 percent of the farmers receive only 15 percent of all net income, it is not surprising that their average net income is only about $1,200 a year (Figure 2). Those farmers producing $5,000-9,999 gross sales are somewhat above the poverty line of $3,000 but do not have enough to support a family of three or more children. In contrast, the 32 percent of the farmers who produce 85 percent of all agricultural sales and receive 74 percent of the net returns have average net incomes in excess of $10,000 (Figure 2).

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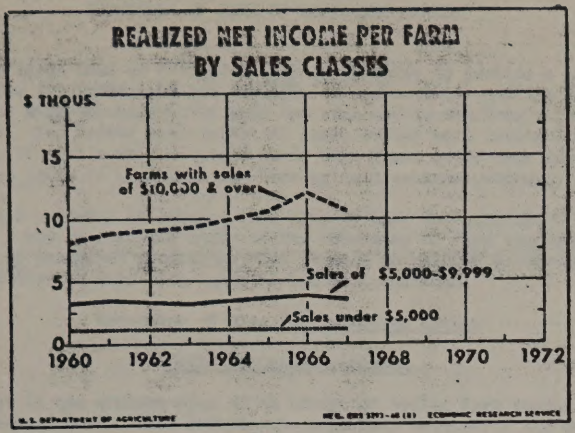
[2] U. S. Department of Agriculture, Farm Income Situation, no. FIS-211 (Economic Research Service, July 1968).

Table 4 .--Income per farm: Realized gross and realized net, by States, 1965-1967 1/

State and region	Realized gross income 2/			Realized net income 3/		
	1965	1966	1967	1965	1966	1967
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Maine	18,947	18,268	17,168	8,191	6,020	3,705
New Hampshire	11,775	14,791	15,034	1,711	2,240	1,309
Vermont	13,009	16,091	16,735	3,828	4,692	4,654
Massachusetts	18,373	19,913	19,712	5,062	5,535	4,835
Rhode Island	19,998	20,623	20,765	3,500	3,816	2,136
Connecticut	22,975	29,970	30,671	5,973	8,918	8,078
New York	15,726	17,087	17,775	4,719	5,961	5,376
New Jersey	24,314	30,558	30,221	6,069	8,801	7,307
Pennsylvania	11,796	13,096	13,474	3,356	4,110	3,874
North Atlantic	15,048	16,666	16,951	4,444	5,146	4,661
Ohio	10,736	12,486	12,447	3,128	4,260	3,570
Indiana	12,802	15,016	14,465	4,255	5,236	4,114
Illinois	18,426	22,104	21,440	5,392	7,462	5,892
Michigan	9,564	10,928	11,221	2,958	3,717	3,396
Wisconsin	11,409	13,139	13,533	4,002	4,970	4,664
East North Central	12,863	15,070	14,939	4,022	5,243	4,410
Minnesota	13,111	15,088	15,502	3,868	4,699	4,163
Iowa	20,314	24,637	24,012	6,301	7,344	5,822
Missouri	9,466	10,585	10,564	3,298	3,790	3,273
North Dakota	16,844	18,790	18,945	5,430	6,569	5,933
South Dakota	16,670	19,442	19,591	5,206	6,529	6,001
Nebraska	19,260	23,978	24,156	4,903	6,710	6,048
Kansas	14,910	18,772	18,681	3,619	6,036	5,259
West North Central	15,325	18,153	18,124	4,599	5,714	4,922
Delaware	27,544	30,542	32,724	7,507	7,530	8,461
Maryland	16,387	17,831	18,501	4,496	4,508	4,533
Virginia	7,313	7,771	8,272	2,390	2,367	2,443
West Virginia	3,789	4,057	4,225	935	967	855
North Carolina	7,265	8,596	8,710	2,980	3,691	3,636
South Carolina	7,356	8,315	9,078	2,769	3,307	3,655
Georgia	12,506	14,126	14,656	4,530	5,155	5,033
Florida	27,173	28,328	29,768	11,411	11,330	11,051
South Atlantic	9,960	11,171	11,613	3,702	4,151	4,139
Kentucky	5,796	6,165	6,633	2,400	2,482	2,730
Tennessee	4,994	5,409	5,514	1,921	1,903	1,815
Alabama	7,568	8,184	8,040	2,802	2,879	2,534
Mississippi	8,546	9,625	10,277	3,547	4,155	4,498
Arkansas	12,665	13,900	13,067	4,649	5,451	4,225
Louisiana	8,742	10,783	12,361	3,328	4,643	5,452
Oklahoma	10,527	11,757	11,510	3,387	4,001	3,486
Texas	14,003	16,367	15,630	4,463	6,070	5,010
South Central	9,164	10,402	10,428	3,288	3,956	3,654
Montana	16,645	20,299	21,214	4,768	6,980	6,631
Idaho	15,923	17,427	17,606	4,574	5,390	4,886
Wyoming	20,157	24,979	25,103	3,606	6,589	6,034
Colorado	24,109	29,001	29,204	3,407	4,863	3,817
New Mexico	20,069	23,441	23,454	6,004	8,689	8,143
Arizona	79,656	88,215	92,633	21,457	22,826	23,650
Utah	12,300	14,130	14,163	2,205	3,210	2,923
Nevada	27,718	32,767	33,291	3,877	7,499	7,163
Washington	14,611	17,116	18,444	4,416	5,818	6,417
Oregon	12,430	13,913	14,820	3,292	4,000	4,160
California	42,739	50,035	51,551	9,853	12,461	11,857
Western Region	24,991	28,796	29,586	5,995	7,677	7,367
United States	13,264	15,289	15,415	4,109	5,049	4,573

1/ Data for 1967 are preliminary. 2/ Excludes changes in inventories. 3/ Excludes changes in inventories, and represents income of farm operators. Source: Farm Income Situation, no. FIS-209, p. 16



Realized net income per farm, by sales classes, 1960-67

Year	Farms with sales--		
	Under $5,000	$5,000 to $9,999	$10,000 and over
		Dollars	
1960	1,128	3,305	8,093
1961	1,189	3,501	8,969
1962	1,165	3,422	9,098
1963	1,140	3,319	9,241
1964	1,198	3,477	9,846
1965	1,208	3,542	10,617
1966	1,296	3,881	12,027
1967	1,229	3,585	10,619

Data from Farm Income Situation, July 1968 (ERS).

Figure 2.--Realized net income per farm, by sales classes, 1960-67

How much should a farm produce for sale in order to realize a net income of $5,000? Since farm costs have been averaging about 70 percent of gross farm income, it appears that the gross should be about $16,000 per farm. In 1967 the average farmer produced somewhat less than this according to the U.S. Department of Agriculture:[3]

Realized gross farm income	$15,415
Farm production expenses	10,842
Realized net income	$ 4,573
Inventory change	132
Total net income	$ 4,705

How many acres would be needed to produce $16,000 gross income? If $100 gross could be produced per acre, then 160 acres would be needed. A gross income of $100 per acre would be a high return even in the Corn Belt unless specialty crops or much livestock were produced. Dryland farming in the Western States would not usually produce more than $25 an acre and so would require 640 acres of cropland to produce a $16,000 gross income.

Irrigated farms producing cotton, sugar beets and other high value crops might gross as much as $160 an acre or more and thus require only 100 acres to produce a gross income of $16,000. However, expenses on such a small farm may run high because of irrigation costs and a net income of $5,000 or more might not be realized.

Only by making complete farm budgets for a specific area can an accurate idea of the amount of land needed for any given income be determined. Therefore, several budgetary studies of farm size will be reviewed in this report.

Farms for the Future: Projections for 1980

Past trends in farm size are helpful in determining the size of farm needed. However, the future also needs to be explored. What would be the size of farms and ranches if all were organized as were the most efficient in 1959? A study by Saupe and Kaldor gives an answer to this question for the North Central Region which includes four of the 17 Western States--North Dakota, South Dakota, Nebraska and Kansas.[4] The results of their analysis for North Dakota and South Dakota are presented in Table 5. In

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[3] U.S. Department of Agriculture, Farm Income Situation, no. FIS-209 (Economic Research Service, February 1968), p. 4.

[4] William E. Saupe and Donald R. Kaldor, "Efficient Organization of the Farm Industry in the North Central Region of the United States in 1980, mimeographed (Iowa State University, Department of Economics and Sociology, 1965).

Table 5.--Changes in number and size of farms if all farms were reorganized as the most efficient were in 1959

Census economic subregions	Number of farms			Size of farms, acres		
	1959	Reorganized	Change (percent)	1959	Reorganized	Change (percent)
South Dakota						
West River	7,400	3,000	-60	2,800	6,900	145
North	12,000	4,400	-63	840	2,200	163
South	12,200	2,800	-77	530	2,300	333
Northeast	8,000	2,300	-71	400	1,300	235
Southeast	10,100	2,300	-77	260	1,100	316
North Dakota						
West River	8,700	1,800	-79	1,200	5,600	370
Central	34,100	10,300	-70	760	2,500	227
East	7,600	3,500	-54	530	1,100	115

Source: Saupe and Kaldor, "Efficient Organization of the Farm Industry," Supplementary tables.

Note: Numbers of farms and acres are rounded. Hence percentages may not agree.

North Dakota the increase in size would range from 115 percent in the eastern area of the Red River Valley to 370 percent in the western area. In South Dakota the adjustment would range from 145 percent in the western area to 316 percent in the southeast. The average size of farms in the two Dakotas would be 1,100 acres in the eastern areas, 2,200 acres in the central areas and 5,600 to 6,900 in the western areas.

Saupe and Kaldor estimate that these organizational changes would reduce the amount of labor required in all areas of the two Dakotas from 3 to 37 percent. To replace this labor and to get the job done, the investment in machinery and livestock would be greatly increased. The increases would vary by areas but would range from 70 to 280 percent.

The total capital requirement (including land) would approach one-quarter million dollars. The increase in capital would vary by areas but would range from 222 to 431 percent. Factor earnings would increase remarkably. They would range from 244 to 1,783 percent. It should be emphasized that these are not predictions of what will result by 1980 but of what could happen if the assumptions used in the study were realized.

Brake has estimated for the United States that the number of farms will decrease 38 percent by 1980, and real estate investment for the average farm in the United States will increase from $47,200 in 1965 to $119,400 by 1980--or 254 percent.[5] He also estimates that total assets, including land, livestock and machinery will increase 240 percent by 1980.

The significant point about these projections is that they emphasize the trends already noted in farm size, and they help make clear the great difficulty that exists in any attempt to determine for the future the minimum size of farm needed for an adequate income.

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[5] John R. Brake, "Impact of Structural Changes on Capital and Credit Needs," Journal of Farm Economics 48, no. 5 (December 1966), p. 1541.

ECONOMICS OF SIZE OF IRRIGATED FARMS

How large must an irrigated farm be in order to provide a satisfactory income for the farmer and his family? To answer this question the farm situation must be analyzed in much the same way as was done with the taxi business. The farmer must select at least one or more tractors with complements of machinery and spread their high fixed costs over enough acres to reduce costs to a minimum and thereby gain maximum returns.

Since a number of studies have already been made, it is not necessary to make a new or original study of the economics of farm size under either dryland or irrigated conditions, but it will be helpful to review four of these studies of farm size under irrigated conditions.

Economics of Size for Irrigated Cotton

Farms in Central Arizona

What is the minimum size of an irrigated cotton farm needed to provide an adequate income? This question is important because of the controversy over the 160-acre limitation on federal irrigation projects.

Nelson, in his study of irrigated cotton farms in central Arizona in 1964, used farm surveys in both irrigation districts and pump irrigation areas to establish the size of farms to be studied, crop rotations, crop yields, machinery needed, cropping practices, and labor requirements.[6] This information, plus other data, was then used in farm budgets to determine the net returns after different water and land charges were paid.

A constant mix cropping pattern was used regardless of the size of the farm but the pattern used in pump areas had 15 percent more cotton and less alfalfa than that of the irrigated districts. The patterns and yields per acre were as follows:

Crops grown	Irrigated districts		Pump areas	
	Cropland (percent)	Yield	Cropland (percent)	Yield
Cotton	40	2.3 bales	55	2.3 bales
Alfalfa	22	6.5 tons	9	4.25 tons
Barley	25	55 bushels	25	55 bushels
Sorghum	13	57-68 bushels	11	57-68 bushels

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[6] Aaron G. Nelson, Costs and Returns for Major Field Crops in Central Arizona by Size of Farm, Arizona Agricultural Experiment Station Technical Bulletin 174 (1964).

Average prices received by farmers for 1958-62 were used for all crops except cotton. For cotton the 1963 support price was used because prices had been declining. Because the same proportions of crops were assumed to be grown on all farms, the gross returns were $230 an acre in the irrigated districts and $261 an acre in the pump areas regardless of size.

The machinery investment was arrived at by applying 1964 new prices to the machinery being used on the farms and reducing this amount by half with the assumption that the machinery was, as an average, half-worn out. All five farm sizes were assumed to use custom operators for combining, grain hauling, baling and cotton spraying, but the 140-acre farm also hired custom operators to pick cotton, scrap cotton, and landplane. The 280-acre farm did its own cotton picking, but scrapping and landplaning were hired. This custom work reduced high fixed machinery costs but increased variable costs as compared with the larger farms. The use of custom work also affects the labor requirements and costs. The rate used for the farmer and year-round hired men was $1.35 an hour. For temporary help the rate was $1.05 an hour. The five sizes of farms studied by Nelson, their fixed and variable costs and their returns to labor and management are shown in Table 6. Because of the difficulty of distinguishing between the labor of the operator and his family and hired labor, all labor and management are treated as a residual in this review of Nelson's study.

Under the assumptions of this study 140 acres of cropland produced only $1,246 net returns for all labor and management. Obviously, $1,246 will not provide an adequate income for most farm families. However, 280 acres would provide $6,484 for labor (including any hired) and management. Whether the 280-acre farm would provide an adequate income depends, in part, upon the amount of labor hired. This is also true of the 480-acre farm with net returns of $17,261.

The net returns per hour of labor are presented as the last line of Table 6. The 140-acre farm returns only $.58 an hour while the 280-acre farm pays $1.37 an hour--slightly more than the going rate for tractor drivers. The 1,600-acre farm returns $2.75 per hour of labor.

When the total costs and returns of Table 4 are presented as average costs per acre the effect of size on costs can be more easily seen as follows:

Acres of cropland	140	280	480	880	1,600
Gross returns per acre	$231	$231	$231	$231	$231
Total cost per acre	221	207	194	191	186
Net returns per acre	10	24	37	40	45

Table 6.--Net returns to all labor and management on cotton farms, irrigation districts, Arizona, 1964

Acres of cropland	140	280	480	880	1600
Total machinery (new cost)	$18,000	$31,000	$ 46,000	$ 73,000	$109,000
Land value per acre	1,000	1,000	1,000	1,000	1,000
Water charge per acre foot	4.50	4.50	4.50	4.50	4.50
Irrigation district charge	0	0	0	0	0
Gross returns @ $231 an acre	32,169	64,338	110,268	202,130	367,446
Total fixed costs	4,922	9,836	13,501	22,087	33,697
Total variable costs[a]	26,001	48,018	79,506	146,055	264,714
Total costs[a]	30,923	57,854	93,007	168,142	298,411
Net returns[b]	1,246	6,484	17,261	33,998	69,035
Total labor used (hours)	(2,165)	(4,720)	(7,933)	(13,870)	(25,121)
Return per hour of labor	$ 0.58	$ 1.37	$ 2.17	$ 2.45	$ 2.75

Source: Nelson, Costs and Returns for Major Field Crops in Central Arizona.

[a] Excludes all labor (including hired) and management.

[b] Net returns to labor (including hired) and management.

This picture may be misleading, however, since Nelson used the same yields regardless of size of farm, and in our analysis the extra costs of labor and management must be paid out of net returns per acre. Because the costs of management do increase sharply as size increases, one should not conclude that the largest farm will provide the highest net income.

The effect of land costs on the net returns, and consequently on the number of acres needed for an adequate income, is important. This is particularly true since the development of irrigated land now often approaches or exceeds $1,000 an acre. The land charge at 5 percent for the three small farms varies with land prices as follows:

Acres of cropland	140	280	480
Land at $500 per acre	$ 3,500	$ 7,000	$12,000
Land at $1,000 per acre	7,000	14,000	24,000
Land at $1,500 per acre	10,500	21,000	36,000

If irrigated land could be developed for $500 an acre rather than $1,000 (as assumed in Table 6), the 140-acre farmer would have another $3,500 of net income, the 280-acre farmer $7,000 more net income, and the 480-acre farmer $12,000 more net income. But, if the land cost is $1,500 an acre, the reverse would be true. These amounts mentioned would be subtracted from already low net farm incomes.

This analysis raises a question as to how much land suitable for irrigation in the Western States can be developed for irrigation at less than $1,000 an acre. There are reasons to believe that the amount is quite small. Successful farming, therefore, would require heavy subsidies for land development. Such subsidies are made by the Bureau of Reclamation from electric power revenues. The Bureau has estimated that developing land for irrigation in the recently approved Oahe project, for example, will cost $988 an acre. Users of Missouri River Basin power will pay 80 percent and farmers only 20 percent of that amount.[7] The Bureau states that "alfalfa, irrigated pasture and corn are expected to be the major crops grown on the basis of acreage, value, importance in rotation, and contribution to a livestock economy."[8]

In Nelson's study no irrigation charge was assumed (Table 6). However, Nelson did consider the effects of alternative irrigation district charges of $4 and $8 an acre. Such increased charges would reduce net incomes of the three small farms by the following amounts:

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[7] U.S. Department of the Interior, Bureau of Reclamation, Region 6, Report of the Oahe Unit, James Division--South Dakota Missouri River Basin Project (Huron, South Dakota: Missouri-Oahe Project Office, 1965), pp. 2, 7, 121.

[8] Ibid., p. 107.

Cropland acres	140	280	480
Charge of $4	$ 560	$1,120	$1,920
Charge of $8	1,120	2,240	3,840

It is clear, then, that when such costs are encountered, the size of the farm would have to be enlarged to produce an adequate income however "adequate" may be defined.

Nelson also studied production possibilities under pump irrigation conditions in Arizona. As previously noted, 15 percent more cotton was assumed to be grown in the pump areas than in irrigation districts, and this increase raised gross income from $230 to $261 an acre.

Fixed costs of machinery and buildings remained the same as before, but depreciation and interest on pump and well were charged at $7 an acre thus increasing total fixed costs as shown in Table 7.

Total variable costs also increased because of the increased acreage of cotton. However, since these increases in costs were not enough to absorb all of the $31 increase in gross returns, net returns to labor (including hired) and management improved. Despite the fact that more labor was used, the returns per hour of labor also improved. This can be seen by comparing the last lines of Tables 6 and 7.

The water pumping charge used in Table 6 was $4.50 an acre foot. However, Nelson also determined the effect of higher rates of $8.50 and $11.00 on net returns. If other costs on returns remained the same, the additional or extra cost would reduce net returns on the three small farms shown in Table 7 by the following amounts:

Additional cost	140 Acres	280 Acres	480 Acres
$8.50 ($4.00 more)	$560	$1,120	$1,920
$11.00 ($6.50 more)	910	1,820	2,420

When water pumping charges are at these levels the 140-acre farm appears to be inadequate in size both on net returns and on returns per hour of labor.

Nelson also examined the effects of higher pump and well costs on net returns. Rates considered were $7, $11, and $14 an acre. Since the $7 rate was used in Table 7, the higher rates would result in additional costs that would have to be subtracted from net returns. The amounts for the three smallest farms would be as follows:

Additional cost	140 Acres	280 Acres	480 Acres
$11.00 ($4 more)	$560	$1,120	$1,920
$14.00 ($7 more)	980	1,960	3,360

Table 7.--Net returns to all labor and management

Acres of cropland	140	280	480	880	1600
Total machinery (new cost)	$18,000	$31,000	$ 46,000	$ 73,000	$109,000
Land value per acre	1,000	1,000	1,000	1,000	1,000
Water charge per acre foot	4.50	4.50	4.50	4.50	4.50
Pump and well cost per acre	7.00	7.00	7.00	7.00	7.00
Gross returns	36,540	73,080	125,541	229,680	417,600
Machinery costs[a]	4,922	9,836	13,501	22,087	33,697
Pump and well costs	980	1,960	3,360	6,160	11,200
Total fixed costs	5,902	11,796	16,861	28,247	44,897
Total variable costs[b]	27,724	50,089	82,112	150,350	273,470
Total costs	33,626	61,885	98,973	178,597	318,367
Net returns[c]	2,914	11,195	26,568	51,083	99,233
Total labor used (hours)	(2,619)	(6,022)	(10,427)	(18,385)	(31,122)
Return per hour of labor	$ 1.14	$ 1.88	$ 2.54	$ 2.80	$ 3.10

Source: See Table 6.

[a] Includes buildings and cement lined ditches, etc.

[b] Excludes all labor (including hired) and management.

[c] Net returns to labor (including hired) and management.

Again these higher rates make 140 acres of cropland appear quite inadequate both in terms of net returns and returns per hour of labor.

It is assumed that the cost of developing land for pump irrigation is $1,000 an acre--the same as for gravity irrigation discussed previously. If the land could be developed at less than $1,000, the land charges would be lower and the net returns higher. But if the land cost were more than $1,000, the reverse would be true.

There are, of course, many other possibilities and combinations that might be explored. Suffice it to say that any increase in costs--for land, water pumping, pump and well depreciation--that is not offset by increased gross returns increases the number of crop acres needed to provide an adequate income for a farm family.

The possibilities of increasing net returns from crops with net returns from livestock should not be overlooked. Beef cow-calf and ewe-lamb enterprises are the most important in the Western States, but they require many cows or ewes and much dryland for grazing if they are to be efficient enough to make an important contribution to the level of living of the farm family. The smaller the irrigated acreage the larger the livestock enterprises need to be to provide an adequate family income. Some estimates of costs and returns from livestock enterprises are presented in Table 9.

Dairy production is a possibility when a market exists for the product. Dairy cows provide a market not only for feed and hays produced but also for unused family labor. Livestock fattening enterprises, and hogs and poultry also provide an alternative to selling grain, and they utilize beet tops, straw and labor that otherwise might not be marketable.

Before leaving Nelson's analysis of farm size it is of interest to inquire whether a farmer with $4,922 fixed machinery costs would not be able to farm more than 140 acres of cropland and thus increase his net returns. Usually this would be possible but to remove any doubt, the fixed costs can be increased to $6,000 and then held constant while acres are varied as follows:

Acres of cropland	100	150	200
Total returns ($231/acre)	$23,100	$34,650	$46,200
Total fixed costs	6,000	6,000	6,000
Total variable costs ($171/acre)	17,100	25,650	34,200
Total costs	23,100	31,650	40,200
Net returns	0	3,000	6,000

Simple arithmetic will show the net returns for other sizes of farms.

Economics of Size of Beet and Potato

Farms in Wyoming

Beets and potatoes are high value crops often grown on irrigated farms in the Western States. How small can these beet and potato farms be and yet provide the farm family with an adequate living? No studies of this question appear to have been made. However, Stevens has presented some costs and returns for irrigated crop enterprises secured from 49 irrigation farmers in the Big Horn Basin of north central Wyoming and from 57 farmers in the southeast Wyoming.[9] These data will be used to estimate the income possibilities of various sizes of beet and potato farms in Wyoming.

The 49 Big Horn Basin farmers had an average of 380 acres of irrigated cropland valued at $300 an acre. Of this land 305 acres were in the crops listed below. The average yields and average unit prices for 1961-65 were:

Crop	Acres	Yields	Price
Sugar beets	87	15.3 tons	$15.00
Corn-grain	13	80 bushels	1.15
Corn-silage	12	16 tons	6.67
Alfalfa hay	72	3.9 tons	20.00
Barley	43	75 bushels	1.20
Oats	28	70 bushels	0.70
Dry beans	50	18.5 cwt.	6.60

Per acre credits for by-products were as follows: sugar beet tops $16; corn fodder, oats, and barley straw $5; bean straw $3; hay $2.

Stevens' enterprise costs are summarized in Table 8. By applying these prices and costs to the acreages given above, the 305 acre farm was found to have an average gross return of $141 an acre and an average variable cost of $84 an acre. Total fixed costs for machinery on this average farm was $4,440, and total net returns to labor and management, including all hired labor, were $12,850. When the hired labor is paid, the net returns to the farm family would undoubtedly be sharply reduced, but the amount of labor involved could not be determined.

What would be the net returns on smaller farms using the same cost and return figures? The figures for a 300-acre farm as well as for three smaller sizes are as follows:

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[9] Delwin M. Stevens, Costs and Returns for Irrigated Crops in Wyoming, Wyoming Agricultural Experiment Station Bulletin 467 (1967).

Table 8.--Characteristics of irrigated farms and costs and returns by crops, Big Horn Basin, Wyoming, 1966

	Beets	Alfalfa	Corn	Dry Beans	Barley	Oats	Potatoes[f]
No. farmers growing	35	47	10	27	37	26	16
Average acres grown	87	72	13	50	43	28	109
Yield unit	ton	ton	bushel	cwt.	cwt.	cwt.	cwt.
Yield per acre	16	4.4	84	18.6	37	30	150
Price per unit	$ 15	$ 20	$ 1.15	$ 6.60	$ 2.00	$ 2.10	$ 1.90
Gross return per acre[a]	256	90	102	126	79	68	285
Total costs per acre[b]	203	83	94	102	70	68	222
Net profits per acre[c]	53	7	8	24	9	0	63
Fixed costs per acre[d]	23	11	13	13	9	9	20
Labor (hours per acre)[e]	(21)	(10)	(11)	(13)	(7)	(7)	(25)

Source: Stevens, Costs and Returns for Irrigated Crops in Wyoming, pp. 16-35.

[a] Gross returns include credit for by-products. [b] Including all labor at $1.50 an hour.

[c] Returns over all costs including labor. [d] Machinery only. [e] Includes operator's labor.

[f] Potato data for 16 producers in southeastern Wyoming.

Acres of cropland	100	150	200	300
Total returns	$14,100	$21,150	$28,200	$42,300
Total fixed costs	4,440	4,440	4,440	4,440
Total variable costs	8,400	12,600	16,800	25,200
Total costs	12,840	17,040	21,240	29,640
Net returns	1,260	4,110	6,960	12,660

While the total returns shown here include hired labor, if any, the amount of hired labor would probably be small. Hence, these returns approach what would be available for farm family living.

Stevens did not list the machinery used by the Big Horn farmers. However, it is probable that those farms with only 100-200 acres of cropland had less machinery than did the average 305-acre farm, and it may be that these fixed costs should be reduced somewhat. However, a reduction in fixed machinery costs may be offset by more variable costs for custom work and possibly more hired labor. Therefore, it cannot be assumed that the net returns would increase by the same amount that fixed costs are reduced.

Livestock is another factor affecting the net returns of the Big Horn Basin farmers. Stevens notes that these farmers fed an average of 216 head of beef calves or equivalent in lambs. In addition, the average farm had 34 beef cows and a flock of 86 ewes to utilize the 33 acres of irrigated pasture and an unspecified amount of dryland pasture. The silage, hay and by-products were credited to crop production, but they would need to be charged to the livestock at the same rate in estimating any additional net returns from this source. Perhaps the most that can be expected from the livestock enterprises is that the values set on the by-products be achieved. Professor Roscoe Snapp, formerly beef production specialist, University of Illinois, used to tell his students that a beef cow should be regarded as a machine to convert unmarketable roughages into a salable product. This view is supported by most studies not only of beef cattle but of sheep. Estimates based on such studies prepared by Aanderud and Crandall indicate the low net returns that can be expected from various beef and sheep enterprises.[10] Under current prices and costs, net returns were only $2.50-4.50 per cow-calf unit and $1.00-$3.00 per ewe. Feeder cattle averaged $3.50 to $17.00 a head. Feeder lambs returned only $49 per 100 head (Table 9).

Stevens also presented potato enterprise cost data on a survey of 16 potato farms in southeastern Wyoming. He noted that these farms averaged 109 acres of potatoes, but he did not indicate the other crops grown. Nevertheless, the income possibilities of potatoes can be evaluated by substituting 87 acres of potatoes for the 87 acres of sugar beets on the

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[10] Wallace G. Aanderud and Francis Crandall, Planning for More Profitable Use of Resources, South Dakota Agricultural Extension Pamphlet EC-652 (1966).

Table 9.--Estimated costs and returns for various livestock enterprises, South Dakota, 1966

	Beef cow--calf[a]	Beef cow--feeders sold[b]	Beef cow--feeder calf sold[c]	Yearling heifers[d]
Gross returns	$95.42	$106.16	$100.27	$211.61
Pasture costs	30.45	30.60	36.99	------
Other feeds	24.34	31.83	21.62	65.00
Cash costs	21.58	21.92	22.63	132.02
Interest	15.17	15.64	15.52	7.42
Depreciation	1.48	1.68	1.61	3.60
Total costs	93.02	91.67	98.37	208.04
Net returns	2.40	4.49	1.90	3.57
Labor (hours)	(8)	(9)	(10)	(4.5)

Source: South Dakota Agricultural Extension Service Pamphlet EC652 (1966).

[a] Assumes feeder calves sold, 88% calf crop, 16% replacement rate calving of 2-year olds.

[b] Assumes calves sold as feeders, 88% calf crop, 16% replacement rate calving of 2-year olds.

[c] Assumes calves sold as feeders, 90% calf crop, 16% replacement rate calving as 3-year olds.

[d] Assumes liberal grain and gain of 425 pounds in 7.5 months on feed.

Table 9.--(Cont.) Estimated costs and returns for various livestock enterprises, South Dakota, 1966

	Feeder steer calf[e]	Feeding heavy steer calf[f]	Ewe and lamb[g]	Ewe and lamb[h]	100 Feeder lambs[i]
Gross returns	$241.08	$275.29	$22.58	$25.53	$2,074.17
Pasture costs	-----	-----	6.00	6.00	-------
Other feeds	81.60	65.25	4.15	4.85	432.00
Cash costs	129.37	193.90	9.47	9.53	1,470.39
Interest	9.64	8.14	1.59	1.60	58.44
Depreciation	3.60	3.60	.52	.52	64.00
Total costs	224.21	270.89	21.73	22.50	2,024.83
Net returns	16.87	4.40	.85	3.03	49.34
Labor (hours)	(6.6)	(4.0)	(2.0)	(2.5)	(30.0)

Source: See first page of table.

[e] Assumes liberal roughage and gains of 600 pounds in 11 months on feed.

[f] Assumes liberal roughage and gains of 400 pounds in 6 months on feed.

[g] Assumes 110% lamb crop, lambs sold as feeders, 20% replacement ewes purchased, 2% ewe death loss.

[h] Assumes 110% lamb crop, half of lambs sold as feeders and all others fed and sold fat; 20% replacement ewes purchased; 2% ewe death loss.

[i] Assumes drylot, 3 month feeding period and gain of 30 pounds per lamb.

305-acre farm examined earlier. With potato yields of 170 cwt. per acre priced at $1.90 per cwt., the net returns for these 87 acres would increase from $7,435 for beets to $12,069 for potatoes.

Why is it then that sugar beet producers do not switch to potatoes? One reason is that the price of potatoes is very sensitive to supply and is therefore erratic (Figure 3). When potatoes are in short supply relative to demand, the price is good and many farmers are induced to plant. But when the supply of potatoes is large, the price falls simply because the demand for potatoes is highly inelastic; that is, a low price for potatoes does not induce people to eat a lot more of them. The production of sugar beets is subsidized with the acreage controlled, and while the income may be less, price risks are also less. However, new land just brought into production may not be able to acquire a sugar beet allotment. In contrast, entry into potato production is not restricted by the government, but risks are high.

What then, can be said about the minimum amount of irrigated cropland needed for an adequate level of living in Wyoming? By almost any definition of adequacy it would appear that 100 acres of irrigated crops including a large acreage of subsidized sugar beets are not enough. At least 150 acres would appear to be needed even with some income from livestock. The precise amount would depend upon the definition of an adequate level of living.

Irrigated Potato Farms in Idaho

Irrigation of land is an expensive process. To be profitable, high value crops must be produced at low cost. One such crop, popular in Idaho, is potatoes. Potato acreage has tripled since 1920, doubled since 1940, and now constitutes 13 percent of all farms receipts in Idaho.

The most remarkable change in potato production has been the substitution of machinery for labor. Seasonal labor, a variable cost, has been largely converted into machinery, a high fixed cost. What happens to this high fixed cost when it is spread over more acres? Using the results of a survey of 88 irrigated potato farms as a basis, Withers has sought to answer this question for potato production on the upper Snake River Valley and in south central Idaho.[11]

These two potato producing areas are similar, but farms on the upper Snake were smaller and were estimated to produce 200 cwt. of potatoes as compared to 211 cwt. for the south central area. Land in both areas was valued at $250 an acre. Potatoes, sugar beets, small grain and alfalfa are the most important crops in both areas. In the southeastern area cost data were secured from 20 potato farms that ranged from 600 to 838 acres

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[11] Russell V. Withers, Potato Production Costs, Idaho Agricultural Experiment Station Bulletin 447 (1965).

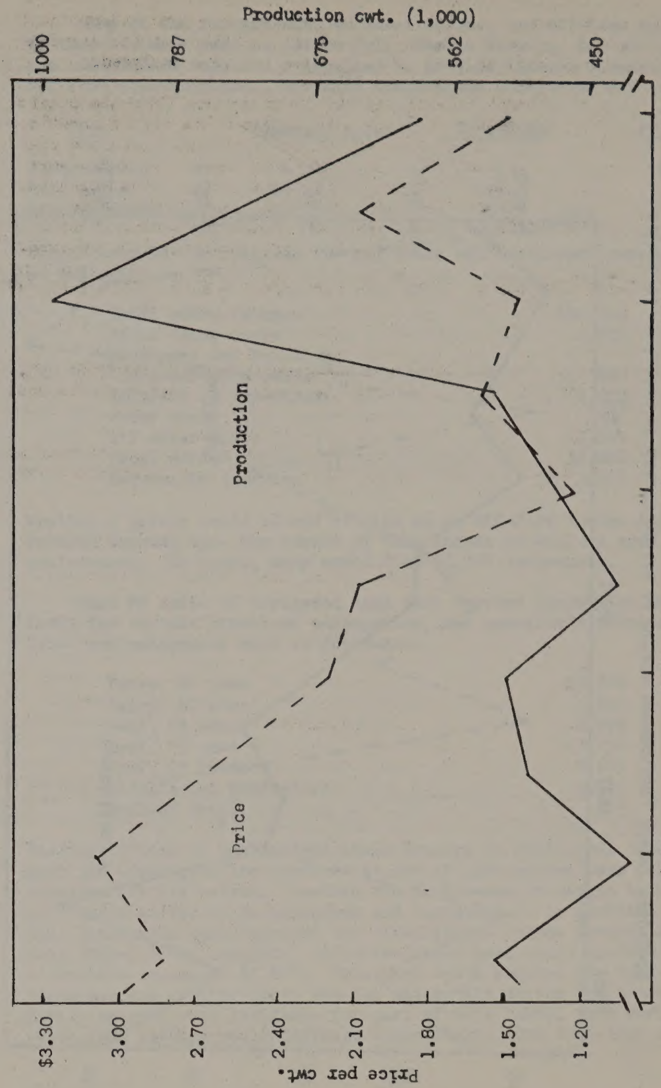

Figure 3.--Relation of potato prices to potato production, ten years, Wyoming, 1957-1966

Source: U.S. Department of Agriculture Crop Production, Agriculture Marketing Service, Crop Reporting Board Annual Summary Reports, (1957-1966). U.S. Department of Commerce, Bureau of the Census, Statistical Abstract(s) of the U.S. 1959-1967.

each. These data were used to calculate the costs for potato enterprises ranging from 140 to 300 acres. While only about one-third of the cropland was in potatoes, only the costs of potato production were analyzed.

Withers made no attempt to estimate the gross returns from the potato crop. No doubt the main reason was that potato prices are highly erratic. He did present Idaho potato production and prices graphically for the years 1950-1963 as reproduced in Figure 4. In only five of these 13 years were potato prices higher than $1.50 per cwt. Since they ranged from $1.00 to $1.50 per cwt. during the remaining eight years, it seemed reasonable to use $1.25 for this analysis of returns to labor and management. At this price the total gross returns in southeastern Idaho would be $264 an acre.

Withers found that the variable cost per acre was $154. This included seed costs of $50 an acre, fertilizer costs of $30 an acre, and the hired labor and operator's labor cost of $32 an acre.[12] It appears that $14 of the $32 are hired labor charges. Because the object of this review is to determine the residual for all labor and management, whether hired or not, the hired labor costs have been subtracted leaving an average variable cost of $140 an acre.

Total fixed costs of potato production consist of "costs...not related directly to output such as machine depreciation, insurance, property taxes interest on investment and operator labor."[13] In order to determine the net returns to labor and management, the operator's labor needs to be subtracted from total fixed costs. Unfortunately, this is not easily done because the amount of operator's labor is not clearly stated. An alternate solution is to estimate machinery fixed costs. This is easier since Withers states that "potato machinery investment was essentially the same on all these farms." He also notes that the minimum amount of equipment necessary to maintain a reasonable potato enterprise was about $38,700. Depreciation on this machinery at 10 percent would be $3,870 a year. Interest at 6 percent on inventory value (one-half new cost) is another $1,161, making a total of $5,031. To this amount should be added taxes, insurance and housing costs. Thus, total fixed costs would be approximately $5,200.

Using the price-cost data just presented, the net returns to labor and management for three given acreages of potatoes are as follows:

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[12] Ibid., pp. 14, 18.

[13] Ibid., p. 10 (underlining added).

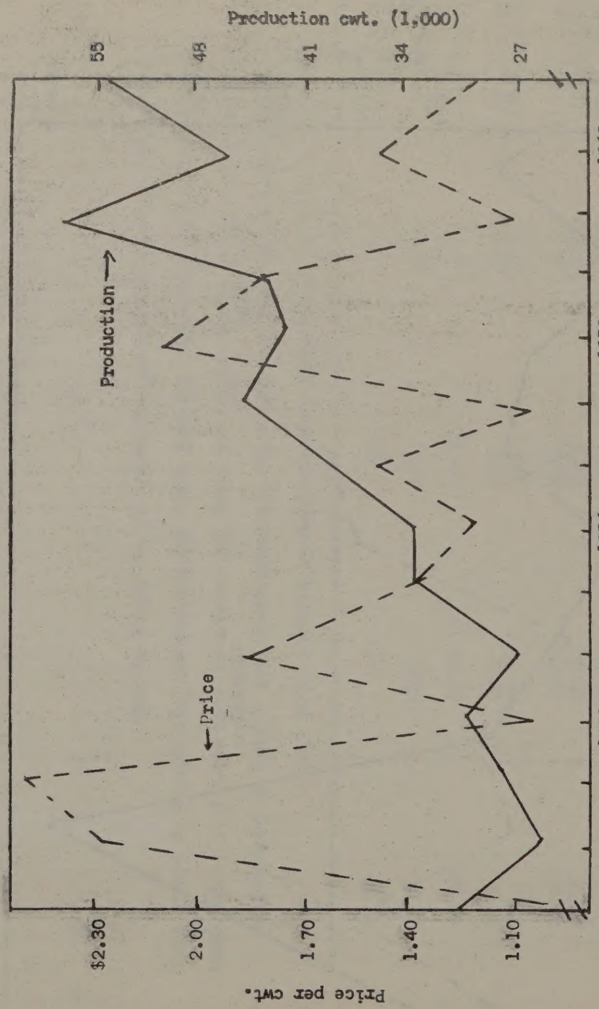

Figure 4.--Relation of potato prices to potato production, Idaho, 1950-1962

Source: Withers, Potato Production Costs, p. 19.

Acres of potatoes	50	70	100
Total gross returns	$13,200	$18,500	$26,400
Total fixed costs	5,200	5,200	5,200
Total variable costs	7,000	9,800	14,000
Total costs	12,200	15,000	19,200
Net returns	1,000	3,500	7,200
Total labor (hours)	(1,100)	(1,540)	(2,200)
Return per hour	$ 0.90	$ 2.25	$ 3.24
Average costs per acre	2.44	2.14	1.92
Net returns per acre	0.20	0.50	0.72

What do these figures indicate about the minimum size of irrigated farm needed to provide an adequate income? First, it should be recalled that these farmers use a three-year rotation of potatoes, small grain and alfalfa. This means that if 70 acres of potatoes are desired, then there must also be 70 acres of small grain and 70 acres of alfalfa or 210 acres of cropland. Such rotations are generally deemed necessary to control potato diseases and insects and help maintain yields. Second, there probably needs to be some pasture land for livestock. It then appears that perhaps 240 acres would be required to provide an adequate income if a 70-acre potato enterprise were selected as a starting point.

It is quite possible, of course, that the fixed machinery costs on the smaller potato enterprise could be reduced somewhat by the use of custom harvesting, or joint ownership of machinery; yet there are limits to these possibilities since generally all farmers in the community need the equipment at the same time. In evaluating the acreage needed it should be kept in mind that (1) small grains and alfalfa are generally less profitable crops than are potatoes and (2) the prices of potatoes are highly erratic with consequent variations in net returns.

Irrigation in Willamette Valley, Oregon

Suppose federal public lands similar to those of the Willamette Valley of Oregon are found suitable for irrigation. How large would these farms need to be to provide a farm family with an adequate level of living? A 1955 study, made by Caldwell and Castle of income possibilities of supplemental irrigation in that area, helps answer this question.[14] Information needed for this study was obtained from a survey of farms which were classified into three groups with average sizes of 40 acres, 103 acres (60 irrigated) and 280 acres (80 irrigated).

Many of the farmers with 40 acres or less had off-farm employment. If these farmers were to devote full time to farming, the enterprises and combination selected would need to provide incomes comparable to their off-farm opportunities. One such combination considered was as follows:

Crop	Acres	Tons/acre	Price/ton
Strawberries	4	9	$320
Pole beans	16	128	125
Canning corn	15	62	20

The returns to the operator for his labor and management were calculated as follows:

Total gross returns	$20,110
Hired labor costs	1,500
Machinery and building depreciation costs	440
Interest on investment	1,018
Water costs	986
All other costs	12,904
Total costs	16,848
Returns to operator	3,262

Whether a person could afford to give up an off-farm income for such returns depends upon the amount of that income as well as upon personal preferences. No doubt, many would find $3,300 inadequate.

When 60 acres of irrigated land were devoted largely to producing feeds for various livestock enterprises, the operator's returns for his labor and management were as follows:

Dairy, 40 cows	$3,504
Dairy, 60 cows	5,818
Beef, 60 cows	-2,794
Beef, 75 cows	-3,730
Beef, 92 feeders	4,241
Alfalfa hay production	1,969
Dryland crops	-375

Feeding 92 head of beef calves would require an additional capital investment and would give the operator $4,200 if 1954 prices were paid and received for the calves. Because the difference or margin between prices paid and received is so important and variable, it is doubtful whether this enterprise would produce the stability of income needed--even if it were judged to be adequate. A 60-cow dairy herd would produce a fairly attractive income of $5,800. This herd would require one full-time hired man and another hired man for six months during the summer. If family members were available for part of this labor, thus reducing costs, net returns would increase accordingly. One full-time man was assumed to be hired with the 40-cow herd. The beef cow enterprises, and dryland crop production all failed to produce any income under the conditions assumed.

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[14] H. W. Caldwell and E. N. Castle, Economics of Supplemental Irrigation on Polk County Farms, Oregon Agricultural Experiment Station Miscellaneous Paper 39 (April 1957).

A larger 280-acre farm with 80 acres of irrigated land would give the farmer higher returns for his labor and management. For example, the 60-cow dairy herd that produced $5,800 net returns on a 103-acre farm (60 irrigated) would now return $6,900. And by increasing both the size of the farm and the number of feeders fed (from 92 to 150 head), returns to the farmer could be increased from $4,200 to $7,200. Dryland farming of the 280 acres without livestock produced a net return for operator's labor and management of only $2,900--thus showing the importance of both irrigation and livestock.

The study reviewed here indicates that 280 acres of land (with 80 acres irrigated) would provide considerably more income than the smaller 103-acre farms but would also require considerably larger investment in irrigation development and livestock. The study does not support the idea that a 160-acre farm with 60 acres irrigated would provide a satisfactory or adequate level of living for a farm family, except possibly where milk production is to be the main enterprise.

Irrigation on Deschutes Project, Oregon

The need for irrigation farms large enough to provide an adequate level of living is well illustrated by the history of the North Unit of the Deschutes Irrigation project of west central Oregon as presented by Kimball and Castle.[15] The first water was delivered to the 50,000-acre North Unit in 1946, and by 1949 water had been delivered to all the project lands. The project was originally divided into 642 operating units, but by 1957 this number had been reduced to 407 units, or 37 percent less. The changes in number of farms by size were as follows:

Size class (acres)	1946	1957	Change (percent)
Under 40	148	68	-54
40 to 80	225	95	-58
80 to 160	247	156	-37
Over 160	22	88	+30
Totals	642	407	-37

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[15] Norman D. Kimball and Emery N. Castle, Historical Development and Adjustments on North Unit Deschutes Irrigation Project Farms, Oregon Agricultural Experiment Station Miscellaneous Paper 133 (1962).

In 1946 the average size of the farms was 77 acres, but by 1958 the average size had increased by 60 percent to 122 acres.

The distribution of the 50,000 acres among the different sizes of farms also changed drastically during the same period as shown in the following figures:

Size class (acres)	1946 (acres)	1957 (acres)	Change (percent)
Under 40	3,700	1,600	-57
40 to 80	13,800	6,200	-55
80 to 160	26,500	18,500	-30
Over 160	4,500	22,200	+39

Why the instability in farm size? To answer this and other questions, a survey of 56 farms in this irrigation project was made. The survey revealed that the average crop income was nearly $20,000 and that more than half of this income was from potatoes. Potatoes were usually followed by two years of small grain and three years of alfalfa. One-fourth of the income was from grain, mostly wheat. Some farms produced alfalfa seed and a few, Merion bluegrass seed.

Median net income was about $6,000, but there were wide variations. Two farms with the lowest incomes each lost $3,500, while the two highest each made over $50,000. The average farm had 152 acres, and its average net income was $8,400. The average net farm incomes by size of farm classes were as follows:

Size class (acres)	Average net income
30 to 90	$ 1,198
90 to 160	6,059
Over 160	19,461

As is generally the case, a few of the largest farms made less net income than smaller farms. This indicates that the effect of size has been offset by other factors that tend to reduce farm income. Poor management, less valuable crops, local weather such as hail, and small numbers of livestock are often causes of these inconsistencies.

By the use of farm budgets the authors were able to control management, crop rotations, yields, prices and costs while the size of the farm was allowed to increase. Thus, the effect of increasing size alone could be demonstrated. The crop rotation plan contained 16 percent potatoes, 33 percent small grain and 50 percent alfalfa. Yields and prices were held constant as follows:

Crop	Yields	Prices
Potatoes	360 cwt.	$ 1.20
Wheat	56 bushels	2.07
Barley	70 bushels	0.98
Alfalfa	42 tons	15.50

Some other characteristics of the three farm sizes and the operator's net returns for his labor and management were as follows:

Cropland acres	60	140	240
Value of land per acre	$ 250	$ 250	$ 250
Machinery cost per acre	166	84	100
Total gross returns	8,355	18,423	31,280
Total fixed costs	1,463	2,578	5,071
Total variable costs	5,963	12,480	19,658
Total costs	7,426	15,058	24,729
Net returns	929	3,365	6,551
Average cost per acre	124	108	103
Net returns per acre	15	24	27

The increase in machinery costs between the 140-acre farm and the 240-acre farm was due, in part, to a shift from custom hire to ownership of machinery. The increases in net returns once again demonstrate the importance of farm size.

Livestock are not included in these budgets. In appraising the results, it should be noted that 60 percent of the 56 farmers surveyed owned livestock. Feeder cattle were reported on 41 percent of the farms, dairy cows on 18 percent, ewes on 9 percent and beef cows on 5 percent. Gross income from livestock averaged nearly $9,000 per farm. If efficiently managed, the livestock would increase the net returns to the operator for his labor and management.

It should also be mentioned that the 240-acre farm includes $3,000 for hired labor. If members of the family could perform part of this labor, income for family living would be increased accordingly.

Irrigated Farms in Imperial Valley, California

In the event that federal public lands similar to those of the Imperial Valley in California are found to be suitable for irrigation, what would be the minimum size of farm that would provide an adequate level of living for a farm family?

Dean and Carter interviewed 86 growers in the Imperial Valley and used the information to study the effect of farm size on costs and returns.[16] The Imperial Valley borders on Mexico in the southeastern part of California and is about 45 miles long and 30 miles wide. It contains about 900,000 acres with 500,000 acres presently irrigated. The climate is arid with low humidity, and the Valley receives less than three inches of rainfall per year. It is hot, with temperatures of 100° F. from March to November, and the winters are mild enough to permit farming all year. Lettuce, for example, is harvested from late December to April, and livestock can be pastured from November to March. Farms in the Imperial Valley have been growing larger at a rapid pace as can be seen in the following figures:

Size class (acres)	1940 (percent)	1959 (percent)
Under 100	66	46
100 to 180	15	12
180 to 260	5	7
260 to 500	8	13
500 to 1,000	3	12
1,000 or more	2	9

Note the 20 percent decline in farms under 100 acres in size and the sharp increase in the larger farms, especially those of 500 acres or more.

Inevitably as farms became larger, an increasing percentage of all land is found in the bigger farms as can be seen in these figures:

Size class (acres)	1940 (percent)	1959 (percent)
Under 100	16	4
100 to 180	14	5
180 to 260	8	4
260 to 500	17	13
500 to 1,000	14	23
1,000 or more	30	51

Note the decline in percentage of land held by farms under 500 acres and the sharp increase in percentage held by farms larger than 500 acres.

The 37 field crop farmers surveyed had the following crops and yields per acre:

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[16] Harold O. Carter and Gerald W. Dean, Cost-Size Relationships for Cash Crop Farms in Imperial Valley, California, California Agricultural Experiment Station Giannini Foundation Research Report 253 (1962).

Crops grown	Acres	Yields
Sugar beets	211	22 tons
Cotton	240	2.2 bales
Barley	273	1.8 tons
Flax	179	45 bushels
Alfalfa hay	478	6.0 tons

The typical farm had nearly 1,100 acres of land of which 1,000 was irrigable. About half the land was owned and half rented. The annual labor bill was $44,000 of which $34,000 was for hired labor and the rest for management--including the operator's.

Because of the nature of the crops and the high labor requirements and costs, machinery investment was heavy. The average was $40,000 but ranged from $1,000 to $350,000.

The average annual gross income of these 37 farms was nearly $200,000 but ranged from $20,000 to $1,500,000. Their productive cash expenses averaged $53,000 but ranged from $5,000 to $354,000.

Quite clearly, few of the 80 farms surveyed represented the minimum size necessary to produce an adequate level of living for a farm family. However, the data does present a point of departure for the search. In the study previously cited Carter and Dean also determined the least cost acreage for field crops in the Imperial Valley. They used the following crops, yields and prices to find total revenue per acre:

Crop	Acres (percent)	Yields	Prices
Alfalfa	40	6.0 tons	$ 26.00
Barley	20	1.75 tons	45.00
Flax	10	45 bushels	2.90
Sugar beets	15	22 tons	14.39
Cotton	15	2.2 bales	158.40
Cotton seed	15	1.0 tons	40.00

The total gross returns for these field crops was $202 an acre (Carter and Dean, Table 6). To handle 320-640 acres of these crops a $59,000 investment in machinery was deemed necessary. Carter and Dean indicate that the average fixed cost of machinery was $18 an acre when spread over 400 acres (their Fig. 4). Hence, total fixed costs would be $7,200 ($18 x 400).

Carter and Dean also show that total average costs are $170 an acre (their Fig. 5). Therefore, the average variable cost can be obtained by subtracting average fixed costs of $18 an acre. Because the farmer and his family may be able to provide all of the labor on the smaller farms, the $27 an acre labor charge may also be subtracted leaving an average variable cost of $125 an acre ($170-18-27=$125).

Using these gross returns and costs the operator's net returns for his labor and management (including bookkeeping and supervision) can be approximated as follows for these three sizes of farms:

Cropland acres	100	160	200
Total returns	$20,200	$32,320	$40,400
Total fixed costs	7,200	7,200	7,200
Total variable costs	12,500	20,000	25,000
Total costs	19,700	27,200	32,200
Average total costs	197	157	161
Net returns	500	5,120	8,200
Labor (hours)	(2,400)	(3,740)	(4,800)
Return per hour	0.21	1.37	1.71

As noted, the $7,200 of fixed costs are for machinery capable of handling up to 640 acres of crops. With a reduction of up to 200 acres of cropland less costly machines might reduce costs and increase net returns. Greater specialization or custom hire might eliminate some machinery and reduce costs. Carter and Dean use $1.60 an hour for skilled labor and $.80 an hour for unskilled. About half of the labor was unskilled. Hence, the average rate would be about $1.20 an hour. Any returns above this rate would be returns for management including supervision of labor, bookkeeping, risks, and uncertainty.

As part of this same study Carter and Dean also investigated a crop rotation with one-third less sugar beets and cotton and one-third more barley, a rotation that they stated might be "representative of young or new field crop farmers." This change in the crop rotation reduced gross returns from $202 to $174 an acre. While costs were also reduced, net returns fell about $3 an acre at the 400-acre size.

The authors also investigated the effects of a 50 percent increase in wages with unskilled wages being increased from $.80 to $1.20 and skilled from $1.60 to $2.40 an hour. They found (pp. 34-36) that these wage changes would increase total average costs about 10 percent regardless of the size of farm. However, if farms under 400 acres used mechanical cotton picking for their second crop, their costs would increase only 6-7 percent while those of 1,000 acres or more would still be 10 percent higher since they were already assumed to be using mechanical pickers. Additional technology such as replacing hand hoeing and thinning with weed sprays, flame cultivation, and mechanical blocking for both cotton and sugar beets made little or no difference in costs for farms of 1,000 acres or more. The effect of new technology on crop yields would vary with many factors and especially with the skill with which it was used. Small farmers might have considerable advantage in this respect over larger ones that had to depend on hired labor. Also as noted, costs would increase less for the smaller farmers. This cost advantage would be still greater if there were a 100 percent increase in wages (Carter and Dean, Fig. 7). However, while any increase in wages would favor family farms, farms of 1,000 acres or more would still have the lowest costs per acre.

Cotton-General Crop Farms, San Joaquin Valley, California

Some evidence concerning the minimum size of a cotton-general crop farm in the San Joaquin Valley which would provide an adequate income can be gained from cost and return studies of a typical farm in the Valley by Goodsell and others.[17] Goodsell declares that "in all instances, the typical farms are important operating units in the specific area and in most instances they are the most common units." The cotton-general crop farm in the San Joaquin Valley on which he reports had the following characteristics in 1966:

Crops	Acres	Yield	Gross returns
Cotton	111	295 pounds	$34,000
Alfalfa	119	5.7 tons	19,300
Barley	38	54 bushels	2,500
Corn	46	77 bushels	5,400
Other, including government payments	---	---	11,500
Perquisites	---	---	700
Totals	314		$73,400

Thus, the gross returns per acre averaged $234 for this farm. Since these returns are typical for the area, it is reasonable to assume that they can be secured on farms of somewhat different sizes so long as size does not cause untimely operations that lower yields.

Goodsell reports that total costs for this 314-acre typical farm were $67,900 of which $47,823 were operating expenses and $20,093 were current interest on capital investment. When these expenses are subtracted from the total gross income of $73,400, there remains $5,400 for operator's labor and management. He also shows that if the historic interest rate of 4.1 percent is used for all capital, the returns for the operator's labor and management are $10,200; but since this review is concerned with the future rather than the past, current interest rates are used in this analysis. The total fixed cost of the $32,000 machinery investment is about $7,500. Of this amount $5,571 is depreciation, and $1,600 is

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[17] Wylie D. Goodsell and others, Farm Costs and Returns, Commercial Farms by Type, Size and Location, U.S. Department of Agriculture, Agriculture Information Bulletin 230 (1967), pp. 56-57.

interest on investment at 5 percent.[18] The balance is taxes, insurance and housing costs. Since total costs are $67,900, subtraction of the $7,500 total fixed costs leaves total variable costs of $60,400 for this 314-acre farm. Thus the variable cost is $192 an acre.

These figures may now be used to explore the net returns that might be secured from farms of other sizes:

Cropland acres	200	300	400
Total gross returns	$46,800	$70,200	$93,600
Total fixed costs	7,500	7,500	7,500
Total variable costs	38,400	57,600	76,800
Total costs	45,500	64,500	83,500
Net returns	900	5,100	9,300
Operator's labor (hours)	(1,660)	(2,490)	(3,320)
Return per hour	0.54	2.05	2.80

It is assumed that the size changes indicated do not affect gross returns of $234 an acre, variable costs of $190 an acre, and total fixed costs of $7,500. However, although total fixed costs are constant, the average fixed costs fall as they are spread over more acres. As a result, average total costs fall and net returns increase as shown in these figures:

Cropland acres	200	300	400
Gross returns per acre	$234	$234	$234
Average total costs per acre	230	217	211
Net returns per acre	4	17	23

While there is no reason to believe that the differences in size would affect either gross returns or variable costs, it is possible that total fixed costs could be reduced on the 200-acre farm by using custom hire for certain operations. However, it seems quite unlikely that these costs could be reduced by more than $1,000, and this reduction is not enough to provide $3,000 net returns on this 200-acre farm. If $5,000 is deemed an adequate income for a farm family, a 300-acre farm is needed under the conditions that existed in 1966.

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[18] Depreciation from Wylie D. Goodsell, Economic Research Service, U.S. Department of Agriculture (letter, 14 November 1968).

ECONOMICS OF SIZE OF DRYLAND FARMS

What is the minimum size of dryland farm needed to provide the farm family in the Western States with an adequate income? Obviously, the size needed will be considerably larger than in southern Iowa where rainfall is plentiful and the growing season long. It will also be considerably larger than that of irrigated farms with their high yields of valuable crops.

There is much historical data to indicate that the dryland farms created by the 160-acre and 320-acre limitations on homesteads have been too small for the Western States. The evidence is found in repeated and persistent efforts to get these limitations changed, in the failure of farmers to get approval for entry, and in the high rate of failure to secure patents as revealed by data presented elsewhere in this report.

If the homestead laws created farms that are too small, how large should they be? The answer varies depending upon yields, costs and prices of the particular area. Fortunately, there have been studies made that discuss the economics of farm size. These will now be reviewed by means of the same techniques used for irrigated farms in the foregoing discussion.

Wheat-Fallow Farms in Montana

Wheat-fallow farms are characteristic of much of the wheat growing areas of Colorado, Montana and Wyoming. If additional wheat-fallow farms are to be created out of public lands, how large must they be to provide an adequate income for a farm family? Rude provides some information on this point in his study of three alternative wheat-fallow plans for four sizes of farms in northeastern Montana.[19] Data for the study was secured from a survey of 39 farms in this area.

Only the most profitable plan will be discussed. This plan places about one-fourth of the cropland in the Conservation Reserve. The crop plans, number of cows kept, and machinery investment are shown in the following figures:

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[19] LeRoy C. Rude, Land Use Alternatives for Dryland Grain-Livestock Operators in Northeastern Montana, Montana Agricultural Experiment Station Bulletin 572 (1962).

Total acres in farm	1,370	1,760	2,830	5,080
Cropland total acres	470	846	1,306	2,520
Wheat acres	125	260	410	800
Fallow acres	125	260	410	800
Conservation reserve acres	126	236	332	672
Hay-alfalfa, etc.-acres	94	90	154	248
Cows, number	38	36	62	101
Machinery investment	$12,000	$15,000	$17,000	$23,000

Conservation payment rates used were $7.66 an acre for diverted acres and $3.83 for non-diverted acres (summer fallow). Spring wheat yields used were 13 bushels per planted acre. This was the 12-year average for the area for 1944-1955. The wheat price used was $1.72 per bushel. Cropland was valued at $50 an acre while pasture was valued at $10 an acre. A 5 percent interest rate was used on land and 6 percent on machinery and livestock.

For the best of three alternative wheat programs in 1960, Rude's budgets showed the following gross income, expenses and net returns to the operator for his labor and management:

Total acres in farm	1,370	1,760	2,830	5,080
Cropland total acres	470	846	1,306	2,520
Total gross returns	7,056	10,302	15,957	29,592
Cash expenses	2,419	3,346	4,341	7,414
Depreciation	1,918	2,321	2,528	3,649
Interest on investment	3,158	4,314	6,709	10,981
Total costs	7,495	9,981	13,578	22,044
Net returns	-439	321	2,379	7,548
Average total costs per acre	16	12	10	9
Net returns per acre	-1	0	2	3

Rude's analysis suggests that at least 4,000 acres or more may be needed to provide an adequate level of living under the conditions assumed in this study. The most profitable of the sizes studied was the 5,080-acre farm. The main reason is that the costs per acre are lowest for this farm (see last two lines of table).

Using another survey of 39 farmers as a source of information, Rude also made a study of the effect of size and alternative crop-livestock plans on net returns in north central Montana.[20] The size of farms and the crop plans were the same as those for northeastern Montana and need not be repeated here. But since winter wheat is grown in this area, a winter wheat yield of 20.2 bushels per planted acre was used--the 12-year average from 1944-1955. Note that this is 7.2 bushels higher yield than used in northeastern Montana. However, the price of winter wheat was $1.61 a bushel--11 cents less than spring wheat. The payment for Conservation Reserve acres was $8.90 an acre and $4.45 for summer fallow. Cattle prices used were the same in both studies: $19 per cwt. for cows and $23 per cwt. for feeder calves. A few more cows were kept in the north central area than in the northeastern area. For these reasons gross income was higher, but costs were also higher.

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[20] LeRoy C. Rude, Land Use Alternatives for Dryland Grain-Livestock Operators in North Central Montana, Montana Agricultural Experiment Station Bulletin 571 (1962).

Land values in the north central area were assumed to be 50 percent higher than in the northeastern area; listed values per acre were $75 for cropland and $15 for pasture. Machinery investment was also somewhat higher.

For the most profitable wheat-fallow plan, the total gross returns, costs, and net returns to the operator for his labor and management follow:

Total acres in farm	1,370	1,760	2,830	5,080
Cropland acres	470	846	1,306	2,520
Total gross returns	$ 8,878	$13,823	$21,395	$40,177
Cash expenses	2,500	3,391	4,673	8,231
Depreciation	1,932	2,351	2,753	4,121
Interest on investment	3,889	5,596	8,556	15,030
Total costs	8,321	11,338	15,982	27,382
Net returns	557	2,485	5,413	12,795
Average total costs per acre	18	13	12	11
Net returns per acre	1	3	4	5

These figures suggest that over 2,000 acres are needed if $5,000 is considered an adequate income for a farm family in this area. Mainly because of lower costs per acre, the 5,080-acre farm was again the most profitable (see last two lines of table).

As can be seen in the previous figures depreciation on machinery and buildings and interest on investment are important costs that affect net returns. Should purchase price or salvage (selling) price be used in calculating these costs? Bucher and Quenemoen have raised this question in their study of four farm sizes in the "Triangle Area" of north central Montana.[21] Their study was based on a survey of 16 farms in an area noted

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[21] Robert F. Bucher and M. E. Quenemoen, "Returns from Dryland Farming in the Triangle," mimeographed, Montana Agricultural Experiment Station (1967).

r its relatively uniform soils, topography, and yields. Additional
formation was secured regarding machinery sizes, capacities, and life
om engineering reports. Using this information, least-cost budgets were
epared for four farms with 400 acres, 900 acres, 1,500 acres and 2,400
res of cropland.

Regardless of the size of farms it was assumed that 65 percent of the
eded cropland was in wheat yielding 25 bushels an acre on summer fallow
d 35 percent in barley yielding 33 bushels an acre. Estimated prices,
cluding government payments, were $1.64 a bushel for wheat and $.80 a
shel for barley. Thus a constant mix of rotations, yields, practices,
d operating costs was assumed for all four farms, but two land and
chinery prices were used--acquisition and salvage.

Land purchase on acquisition price was set at $158 an acre. But
lvage values ranged from $124 an acre for the smallest farm to $130 an
re for the largest because of selling costs. Machinery purchase on
quisition price was set at 10 percent more than investment value as
sually calculated (new cost less scrap value divided by two), and sale
salvage price was set at 15 percent less than investment value. The
tal farm investment is strongly affected by this choice in land and
chinery prices as can be seen in the land and machinery investment fig-
res that follow:

tal acres	860	1,935	3,225	5,160
quisition	$150,000	$348,000	$583,000	$904,000
lvage	117,000	278,000	471,000	737,000
ifference	33,000	70,000	112,000	167,000

The farmer's net returns for his labor and management at acquisition
nd salvage prices are shown in these figures:

otal acres	860	1,935	3,225	5,160
ropland acres	400	900	1,500	2,400
t acquisition prices	$ -225	$ -392	$ -279	$ 3,368
t salvage prices	1,407	3,118	5,370	11,711

erhaps the most important implication of this study is for young farmers
ho must pay acquisition prices for land and machinery. They will need
t least 2,400 acres of cropland (5,200 total) to provide them with any
ope of achieving a satisfactory level of living under the assumptions of
his study.

Wheat-Fallow Farms in Wyoming

If federal public lands in Wyoming are to be made available for dry-
and wheat production, how large should these farms be if the farm family
s to have an adequate income? Krenz and Miller determined the best man-
gement plans for six typical farm sizes in southeastern Wyoming where more

than 60 percent or more of its wheat is produced.[22]

Wheat accounts for only about 7 percent of total cash receipts of Wyoming farms and ranches. Nearly all of the wheat is grown in the ten eastern counties under dryland conditions. A wheat-fallow strip cropping system is generally used. Strips vary in width depending upon how susceptible the soil is to blowing. Hard red winter wheat is seeded in August or September on the summer fallow. Stubble on the harvested strips is left standing until the following spring to prevent soil blowing. When the fall seeding has grown enough to prevent wind erosion, the stubble is worked with large tractors and cultivators or rod weeders. Harvesting is done by pull-type or self-propelled combines.

Twenty-year average crop yields were used in the analysis of alternative plans. These yields which take crop losses into account were: wheat, 16 bushels per planted acre; barley, 21 bushels per planted acre. The wheat price used was $1.72 a bushel. Krenz and Miller analyzed the probable effects of nine possible wheat programs on six sizes of farms. A three-price program gave the highest net returns to the farmer for his labor and management on all farms. The gross returns, costs and net returns for the four largest farms were as follows:

Total acres in farm	480	795	1,400	3,870
Pasture acres	64	111	309	1,888
Cropland acres	416	684	1,091	1,982
Wheat allotment acres	126	205	329	548
Return to land and operator	$3,594	$6,047	$10,151	$21,924
Land charge	1,515	2,483	4,205	9,297
Net returns to operator	2,079	3,564	5,946	12,627
Net returns per acre	5.00	5.21	5.45	6.37
Labor (hours)	(643)	(971)	(1,908)	(4,233)
Labor returns per hour	3.23	3.67	3.12	2.98

The land charge consisted of 5 percent of the value of the land with cropland valued at $70 and pasture at $25 an acre.

Feeder calves were used in all farm plans and sheep were included in plans for the two largest farms where pasture was an important resource. The number of calves and sheep varied depending upon the cropping system used. With the addition of livestock enterprises, these four farms reflect other differences besides the changes in farm size, and therefore the effects of size alone cannot be observed.

Of the four sizes studied the 3,870-acre farm produced the highest net returns. If $5,000 is assumed to be an adequate income for a farm family, then a farm of at least 1,200 acres would be needed under the conditions assumed in this study.

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[22] Ronald D. Krenz and Thomas A. Miller, Wheat Farming in Wyoming; (1) Characteristics and Clarification of Wheat Farms and (2) Profit Maximizing Plans for Specialized Wheat Farms in Southeast Wyoming, Wyoming Agricultural Experiment Station Bulletins 391 and 392 (1962).

Wheat-Fallow Farms of Washington and Oregon

How large must wheat-fallow farms of central Washington and north central Oregon be in order to provide an adequate income for a farm family?

Goodsell and others have presented 1966 data for a typical 1,520-acre farm in this area that helps answer this question.[23] Of the 1,520 acres in this farm, 1,100 acres were cropland. There were 400 acres of winter wheat and 100 acres of other small grains. About 600 acres were summer fallowed. Crop yields per harvested acre were: wheat, 32.5 bushels; barley, 40.9 bushels; and hay, 1.2 tons. A dozen beef cows were kept and a dozen pigs raised.

Total farm capital was nearly $200,000. Machinery and equipment investment was $21,000, and land and buildings were valued at $167,000.

Total gross income was $34,325 of which wheat contributed $20,235. Thus the average gross income per acre was $22.50.

Total costs were $26,827 and include interest on investment at current rates. Total fixed costs of machinery were $3,500 and consisted of $2,237 for depreciation, $1,050 for interest on machinery investment at 5 percent and taxes, insurance and housing charges.[24] By subtracting the $3,500 total fixed costs from the $26,827 total costs, the total variable costs are found to be $23,327. For the 1,520-acre farm this is an average variable cost of $15.35 an acre.

The net returns from smaller farms can now be determined--assuming machinery costs are fixed and all other returns and costs vary directly with the acres farmed. Thus the net returns to the operator for his labor and management for a 1,000-acre and for a 1,250-acre farm as well as for the 1,520-acre typical farm would be as follows:

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[23] Wylie D. Goodsell and others, Farm Costs and Returns, Commercial Farms by Type, Size and Location, U.S. Department of Agriculture, Agriculture Information Bulletin 230 (1968), pp. 66-67.

[24] Depreciation figure from Wylie D. Goodsell, Economic Research Service, U.S. Department of Agriculture (letter, 14 November 1968).

Total acres in farm	1,000	1,250	1,520
Cropland acres	720	900	1,100
Total gross returns	$22,500	$28,125	$33,750
Total fixed costs	3,500	3,500	3,500
Total variable costs	15,250	19,062	23,327
Total costs	18,750	22,562	26,827
Net returns	3,750	5,563	7,498
Labor (hours)	(2,260)	(2,812)	(3,420)
Returns per hour	$ 1.66	$ 1.98	$ 2.19
Average total costs per acre	26	25	24
Net returns per acre	5	6	7

Of these three farms the largest appears to be the most profitable because the total costs per acre are lowest on this farm (see last two lines of table). While it is possible that fixed costs might be reduced somewhat on the 1,000-acre farm, this analysis suggests that more than 1,000 acres would be needed to provide $5,000 for a farm family in this wheat-fallow area.

Wheat-Pea Farms in Idaho and Washington

What is the minimum size of a wheat-pea farm that will provide a satisfactory income for a farm family? Goodsell and others have presented costs and returns for a typical wheat-pea farm for 1957-59, 1964, 1965, and 1966 that are helpful in seeking an answer to this question.[25]

In 1966 the typical wheat-pea farm consisted of 615 acres of which 412 were harvested, and 148 were listed as "other cropland". The crops harvested, crop acres, crop yields per acre, and gross returns were as follows:

Crop	Acres	Yields	Gross returns
Wheat	189	59 bushels	$16,451
Peas	103	15 cwt.	7,061
Barley	94	52 bushels	---
Other crops	26	--	4,920
Pasture, etc.	203	Livestock income	3,210
All other income, including government payments			5,860
Total gross returns			37,502

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[25] Wylie D. Goodsell and others, Farm Costs and Returns, Commercial Farms by Type, Size and Location, U.S. Department of Agriculture, Agriculture Information Bulletin 230 (1967), pp. 86-87.

The costs and net returns to the operator on this typical 615-acre farm were as follows:

Total gross farm income	$37,502
Total operating expenses	14,047
Interest on capital	13,009
Total costs	27,056
Net returns	10,446

To explore the income possibilities of other farm sizes the fixed ownership costs of the $24,870 invested in machinery needs to be separated from other costs. Goodsell reports that annual machinery depreciation on this farm was $3,178.[26] Interest on investment at 6 percent was another $1,500 making a total of $4,778. Taxes, insurance and housing would probably increase the total fixed costs to $5,000. Since total costs are $27,056, subtraction of the fixed costs leaves total variable costs of $22,056 or $36 an acre. With these figures, the gross returns, costs, and net returns for three other sizes of farms can now be calculated as follows:

Total acres in farm	200	400	500
Total gross returns	$12,200	$24,400	$30,500
Total fixed costs	5,000	5,000	5,000
Total variable costs	7,200	14,400	18,000
Total costs	12,200	19,400	23,000
Net returns	0	5,000	7,500
Labor (hours)	(940)	(1,880)	(2,350)
Returns per hour	$ 0	$ 2.66	$ 3.19
Average total costs per acre	61	48	46
Net returns per acre	0	12	15

It is evident that a farm of at least 400 acres is the minimum if $5,000 net returns for labor and management are considered an adequate farm income. It should be noted, however, that even on this size of farm the operator would not be fully employed.

Michalson also investigated farm size in the wheat-pea area of Washington and Idaho.[27] Using linear programming he found the least cost plan for five farm sizes. The smallest size was a 600-acre farm with 522 acres of cropland. Gross returns, costs, and net returns on this farm were as follows:

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[26] Wylie D. Goodsell, Economic Research Service, U.S. Department of Agriculture (letter, 14 November 1968).

[27] E. L. Michalson, Economics of Farm Size in the Washington-Idaho Wheat-Pea Area, Washington Agricultural Experiment Station Technical Bulletin 52 (1967).

Total gross returns	$34,400
Total fixed costs	20,334
Total variable costs	11,002
Total costs	31,336
Net returns	3,064

These net returns of $3,064 on Michalson's 600-acre farm are $7,400 less than the $10,446 net returns on Goodsell's typical wheat-pea farm of 615 acres. Higher fixed costs are largely responsible for this difference. Whatever the comparative merits of the two studies, Michalson lends little support to the idea of small, but efficient, farms. He found that all measures of income and efficiency increased as farms were enlarged from 600 to 1,600 acres and that net returns continued to increase up to 1,900 acres.

VII. SUMMARY AND CONCLUSIONS

What is the minimum amount of land needed to provide a farmer and his family with an adequate income? The main purpose of this study was to help the Public Land Law Review Commission answer this question. The Commission needs this information before it makes recommendations regarding the 160-acre and 320-acre limitations of the homestead acts and other laws concerned with the disposal of federal public lands for crop production.

But what is an adequate living? This question must be answered before the minimum amount of land is determined, and one purpose of this study was to provide information which will help the Commission define "adequate" income. Another was to provide information about the incomes that can be expected from farms of various sizes by reviewing some studies of farm size that have been made in the Western States.

Competition for labor and management plays an important role in determining what is considered an "adequate income" in any society. No society can long afford to encourage men to enter farming if they can contribute much more to society in some other line of work. It is generally true that a farmer making $5,000 or less, for example, is doing both himself and society harm if he can earn $8,000 or more in some other kind of work. Most farmers will not continue farming under these circumstances nor should the federal government encourage them to do so. On the contrary, the government should make it easy for such people to find employment where their abilities can be fully utilized. Hence, the federal government should not create small inadequate farms that neither provide full employment nor adequate incomes for farm families. To do so is to create rural slums.

In recent years the President's Council of Economic Advisors has been using $3,000 as the poverty line for family incomes. With this $3,000 as a base, economists have concluded that $5,200 is the poverty line for a family with three or four children when the oldest is 18 years of age or older.

In the United States 54 percent of the farms produced less than $5,000 worth of products in 1967. The realized net income of this group has averaged only $1,200 a year since 1960. Some 14 percent of the farmers produced $5,000 to $10,000 worth of products in 1967. This group has averaged only $3,500 a year since 1960. Another 32 percent of the farmers produce 35 percent of all farm products sold and receive 74 percent of the total net farm income. Their net incomes have ranged from $8,000 to $12,000 a year since 1960.

How much gross income is needed to produce $5,000 of net income? Because farm expenses average about 70 percent of gross income, about $16,000 of gross income is needed. The number of acres needed to produce this gross income depends upon the productivity of the land and the crops grown. If the gross is $100 per acre, then 160 acres would be sufficient. Such a gross may be achieved in the heart of the Corn Belt, or under irrigated conditions, or when specialty crops are grown. If the gross is $50 an acre, then 320 acres would be needed. Such crop incomes are typical of the western edge of the Corn Belt. If the gross is only $25 an acre, then 640 acres are needed, and additional land may be needed for summer fallow. This latter gross income is typical of many dryland wheat producing areas.

Whether or not a gross of $16,000 will produce a net income of $5,000 depends upon the costs involved, and these vary widely from crop to crop and area to area. Careful analyses of both production possibilities and costs are needed to determine accurately the size of farm necessary to produce $5,000 of net income.

A number of studies of farm size made in Iowa and the Western States were reviewed to determine the incomes that various sizes of farms would produce. The relation of size of irrigated farm to net returns for labor and management is shown in Figure 5. When $3,000 is used as a poverty line, at least 160 acres of irrigated cropland are needed to prevent a poverty income. If $5,000 is used, nearly 300 acres of cropland would be needed to lift the net income above the poverty level.

It is of interest to compare the relationship of average net returns from Iowa dryland field crops with that of the irrigated farms further west. About 200 acres of cropland are needed to produce $3,000 of net returns under dryland conditions on upland farms in southern Iowa (Figure 5). These farms are about 33 percent larger than western irrigated farms because of pasture and other land unsuited for crops in this area of Iowa. These whole-farm figures are presented in Figure 6 for comparison with other dryland farms of the West which are also on a whole-farm basis. Thus, even in southern Iowa with 32-inch annual rainfall and a 160-day frost-free growing period, a 266-acre farm is needed to produce net returns of $3,000.

In the Western States with much less precipitation, higher elevation and shorter growing seasons, much larger farms are needed. For example, Wyoming wheat farms need at least 700 acres to achieve a $3,000 net return. If the poverty line is set at $5,000, farms in the Western States must exceed 1,200 acres in size. In Montana, over 2,600 acres are needed to produce $5,000 net income.

While studies of the economics of farm size reviewed are often based on varying assumptions regarding yields, prices and costs, the conclusion is inescapable that there can be no one minimum size of farm that will produce any given level of income that may be designated as "adequate" for a farmer and his family. If the Public Land Law Review Commission decides that $5,000 should be the minimum income, then the 160 and 320-acre limitations are, with few exceptions, too low to provide this amount.

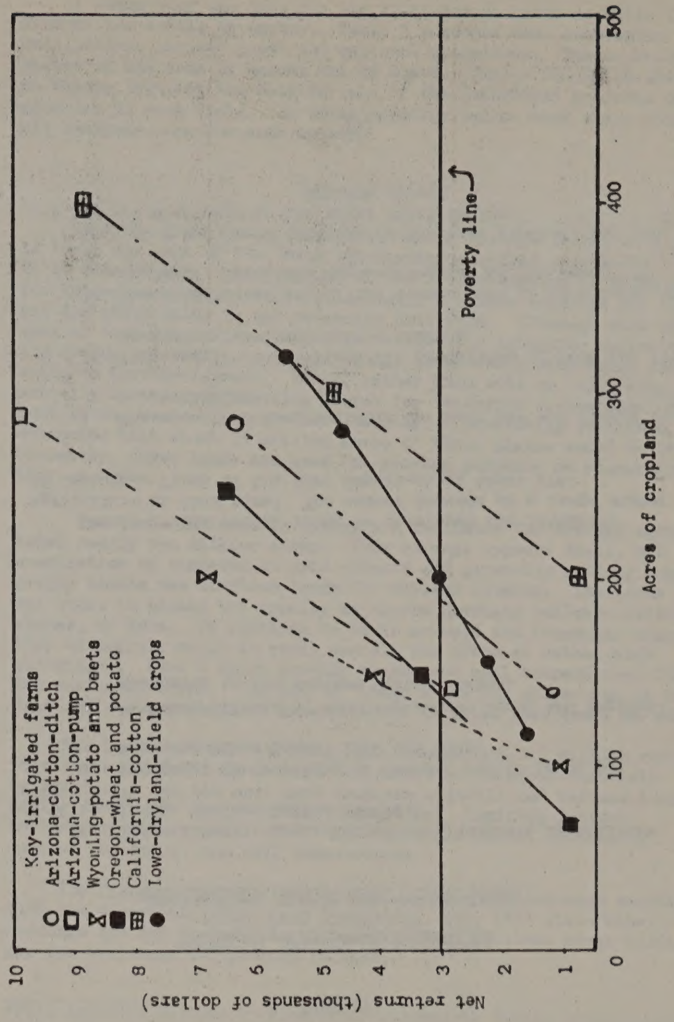

Figure 5.--Relationship between net returns to labor and management and acres of cropland for six farm size studies in Western United States

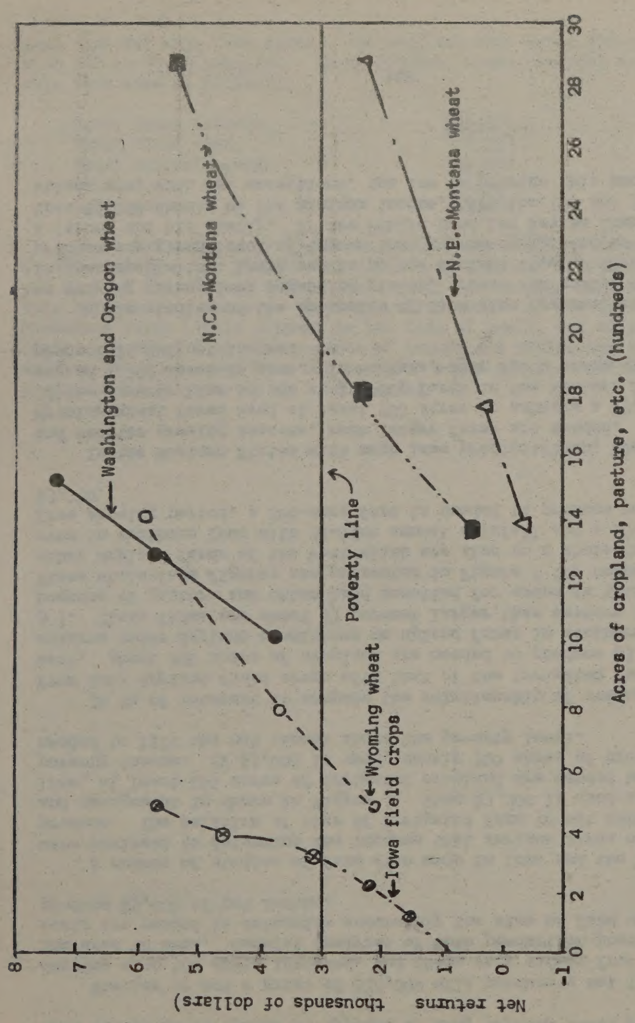

Figure 6.--Relationship between net returns to labor and management and total farm acreage for five dryland farm size studies in Western United States

PART IV

POTENTIAL EFFECTS OF ADDITIONAL AGRICULTURAL OUTPUT FROM PUBLIC LANDS

A. Federal Public Lands Suited for Intensive Agriculture in the Western United States.

B. Potential Contribution of Federal Public Lands to Food and Fiber Needs, 1980 and 2000.

C. Probable Effects of New Cropland on Local and Regional Economies in the Western United States.

Should arable public lands be developed for intensive agriculture at this time? The answer depends on a large number of factors. Three of the more important of these are:

1. The amount of land suitable for such use and likely to be available.
2. The need for these lands for production of food and fiber to meet current and future demands.
3. The probable effect of the development of such lands on regional, State and local economies of the West.

Each of these important factors has been studied, and the results are presented in the pages which follow.

A. FEDERAL PUBLIC LANDS SUITED FOR INTENSIVE AGRICULTURAL DEVELOPMENT

Introduction

Since 1781 the federal government has disposed of 1,043 million acres of public lands; however, federal agencies in the 17 Western States still administer 371 million acres of such lands. Most of these lands are used for livestock grazing and forestry while others are used for parks, wildlife and defense. Some are deserts and many are mountainous. How much of these remaining federal public lands is suited for intensive agriculture or crop production? This is an important question because present public laws still encourage farmers to attempt to settle on federal lands that frequently are not suited for agriculture.

The purpose of this report is to present estimates, by States, of the amount of public land suited for intensive agricultural development. These estimates are based on available data and informed judgment and not on any new field investigations. The data, for the most part, were obtained from the agencies having administrative responsibility for the lands. In cases where data were not available from the agency concerned, projections were made from information furnished by the State Agricultural Experiment Stations and the Soil Conservation Service. Data were gathered and recorded from each State through personal contacts with the administrators of each agency and their technical people in that State.

Federal public lands deemed suitable for intensive agriculture were classified as (A) lands physically and economically suited for dryland crop production under prevailing management practices; (B) lands economically suited for irrigation and for which water is potentially available or expected to be available; and (C) lands suited for irrigation but for which water is not legally or physically available at present under existing patterns of water rights and water use.

A summary of the data for the 17 States is given in Table 1. Table 2 shows the totals by agency. Table 3 presents data concerning land utilization, project lands and national grasslands. Tables 4-20 are summaries of the data by agency and by State. Tables 21-38, in the Appendix to Volume IV,* list the data for all of the individual projects of specific agencies in each State. In these appendix tables each table consists of six sections--one for each agency.

Regional Totals

In Table 1 the total acreage in the 17 Western States as a whole is shown for each of the three categories described previously. It is to be noted that 90 percent of the land estimated as being suitable for intensive agriculture is in category C--lands suitable for irrigation but for which water is not presently available. Although much of the area of these 17 Western States is limited for intensive agriculture by topography and soils, there are fairly extensive plains whose soils are suitable for development. Water, rather than soil or topography, actually is the most limiting factor for intensive agricultural development in the West. If water were legally or physically available, it is estimated that about 35 million acres of these plains could be irrigated. Presently, these lands are used for grazing purposes or recreation, or they are idle.

The lands included in category A (suitable for dryland agriculture) total nearly two million acres. This acreage appears small, but the combination of semiarid to arid climate and generally rolling topography limits use of these lands for dryland farming. The lands do not occur in blocks but usually as narrow mountain valleys, colluvial slopes, or fans. In addition to their awkward and irregular shapes, they ordinarily occur in small parcels and often at rather high elevations. Here a short growing season and cool temperatures limit the choice of crops. For many of these areas hay production is the best and perhaps the most intensive use to which they could be adapted.

The lands included in category B total about 1.3 million acres. They occur mainly along streams and rivers or in areas underlain by aquifers. For the most part they are alluvial and terrace lands having deep soils and favorable topography. Limiting factors include irregular parcel size, salinity and seasonal wetness in some of the soils, and cool temperatures.

The figures fortotal land in Table 1 does not coincide exactly with the figure in Public Land Statistics, 1967 (45) since minor holdings are not included in all cases. Many of these minor holdings are for buildings and parking grounds.

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*This appendix follows working paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

State Totals

The acreages of lands estimated to be suitable for intensive agriculture are listed, by States, in the three categories described in the Introduction. The Great Plains States have relatively small acreages of public land. These range from 588,981 acres in Kansas to 2,338,738 acres in Texas while the acreage in each of the mountain States, except Washington, generally exceeds 20 million. Although the plains States have much smaller totals of public land, they have proportionally larger percentages of land in category A than the mountain States. On the other hand, the mountain States, except Montana, have higher percentages of land in category C versus those in A. These differences reflect the generally more humid environment of the Plains. In the mountain States the areas with topography favorable for intensive agriculture are mostly dry, and only when water is supplied by artificial means can they be considered arable.

The Western States having the largest acreages of arable lands (category A) are Wyoming, Montana, Texas, the two Dakotas, California and Colorado. Each of these States has more than 100,000 acres in this category.

The States having the largest acreages of public land estimated to be irrigable (category B) include Wyoming, Washington, Idaho, and California. Each of these States has over 100,000 acres in this category. The States with the largest acreages in category C include Nevada, Arizona, and California, each having over six million acres estimated to be irrigable if water were available.

Agency Totals

Table 2 lists the estimated acres in each category under the agency which is administratively responsible for the land. Seven agencies are listed in Table 2, plus the National Grasslands (Land Utilization lands) which are listed as the eighth entry. The National Grasslands (Land Utilization lands) is not an administrative agency--these lands are administered either by the Forest Service or the Bureau of Land Management.

Table 2 also includes for each category the percentages of total lands administered by the various agencies; for example, the Bureau of Reclamation has 22,972 acres considered arable--0.25 percent of total lands administered by that agency (8,977,277 acres) in the 17 Western States. Totals for the agencies in each State appear in Tables 4 through 21.

The percentages of land considered suitable for dryland agriculture range, among agencies, from 0.15 percent for National Park lands to 3.07 percent for Corps of Civil Engineers lands. National Grasslands (Land Utilization lands) were considered 8.39 percent arable. These lands, accounted for in the Bureau of Land Management and Forest Service figures, are mostly in the plains area where more favorable soils, topography, and climate make them more adapted for dryland agriculture than are the mountains and deserts of the West. So far as total acres of land are concerned, it is apparent from Table 2 that the Forest Service and the Bureau of Land Management account for over two-thirds of the acreage reported.

In category B, Table 2 indicates that the percentages of lands suitable for irrigation and for which water is available range from 0.03 percent for the Corps of Civil Engineers and National Park Service to 4.72 percent for the Bureau of Reclamation. The Bureau of Land Management and the Bureau of Reclamation together account for over 70 percent of the land reported in this category.

In category C, Table 2 lists the percentages of lands suitable for irrigation, but for which water is not available, as ranging from 0.29 percent for the Corps of Civil Engineers to 23.92 percent for the Department of Defense. Although the Department of Defense has the largest percentage, it reports only about 13 percent of the total lands. The Bureau of Land Management controls about 80 percent. Five States, Nevada, Arizona, California, New Mexico, and Idaho, have nearly 82 percent of all land in category C (Tables 4-20).

Land Utilization lands are presented by States and agencies in Table 3.

Agency Totals Listed by State

Tables 4 through 20 are breakdowns of agency lands within each State. The States are arranged alphabetically with Arizona data in Table 4 and Wyoming data in Table 20. These tables show the acreages in each of the three categories defined in the Introduction. Also included are figures for the estimated fair market value of some of the lands in categories A and B. Estimated values for other A and B lands were not attempted since there have been few sales of similar lands in the area.

The estimated value figures of lands in category B are subject to many limitations. Soils and topography vary, resulting in a range of land classes. Moreover, the environmental factors of climate and local site result in a wide range of conditions for crop growth. Very favorable soils may occur at high elevations where low temperatures restrict the choice of crop. Nearness to a market is a third variable. Generally class I and II soils, if they occur in a favorable climatic environment and are located where the crop can be marketed, are valued at $1,000 an acre or even as high as $1,500 an acre. These lands occur in Arizona and California along the southern margin of the region. An average figure for the central part of the region for class I and II land is $500 to $900 per acre. Along the northern margins of the region and for class III land generally, the estimated market price per acre ranges from $250 to $500 per acre.

The estimated market value of lands suited for dryland agriculture is as low as $45 or $50 per acre for land suited only for hayland in the drier or colder parts of the region. Estimates up to $300 or $350 per acre were made for the areas having little relief, deep soils, and a relatively moist, warm climate.

Subdivisions of Agencies for Each State

Each agency responsible for public lands within a State has a number of projects varying from one or two to many. The estimated acreage figures for these projects were the starting points in the data collecting process and furnish the raw data upon which this report was constructed. Because of their bulk, these tables were placed in the Appendix to Volume IV.*

Sources of Data

As stated in the Introduction, the data appearing in the estimates were obtained, for the most part, from the agency having administrative responsibility for the land. In cases where these data were not available, as in most of the Department of Defense land, the figures were obtained by matching the lands in question to a soil map for which soil classification data were available.

Considerable progress has been made in some States toward obtaining data on irrigation suitability regardless of the ownership of the land. One project of this nature is the Columbia-North Pacific Comprehensive Study which is cited in preliminary form (55). Other studies which are not yet in final form are the River Basin studies (70-72). When completed, these will provide data on the irrigability of lands surveyed.

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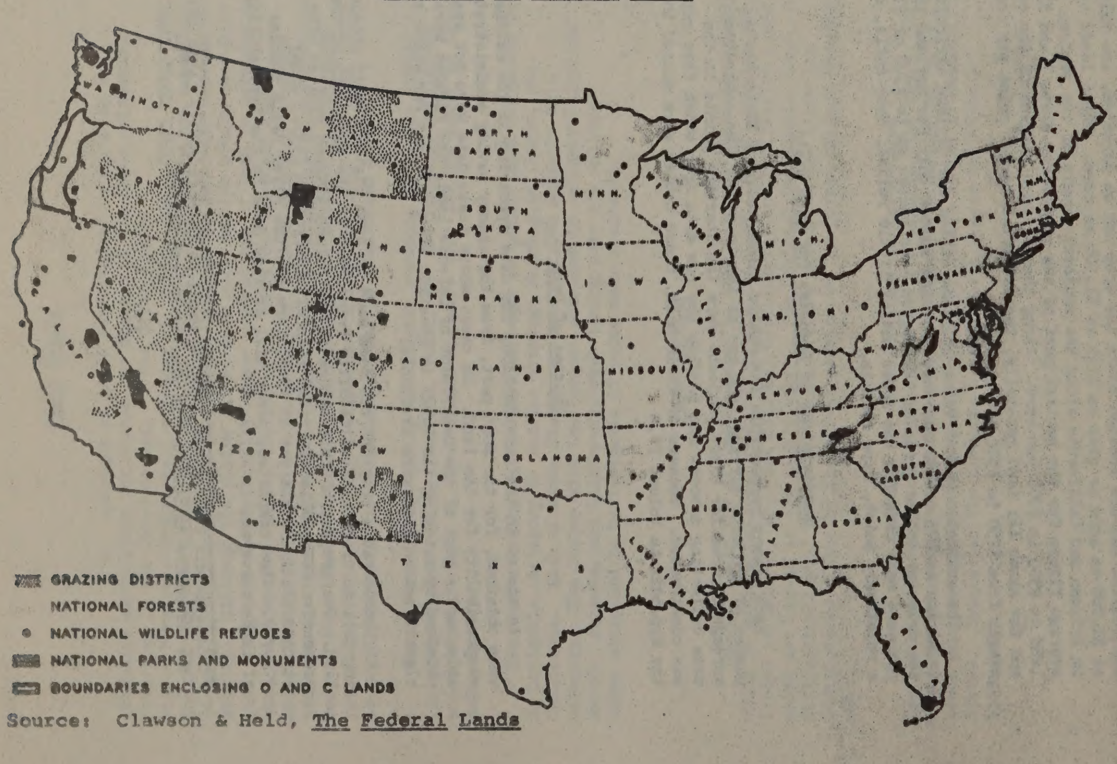
*This appendix follows the working paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

After the analyses of this report were completed, it appeared that 0.6 million acres of National Grasslands or land utilization lands administered by the Forest Service should have been included inasmuch as L.U. lands administered by the Bureau of Land Management were included. The location and amount of the arable L.U. lands administered by these two agencies are shown in Table 3. The National Grasslands would provide 464,000 additional acres for dryland farmers and another 100,000 acres for irrigated farming.

This addition would only increase the arable Federal lands from 1.6 million to 2.2 million acres. The effect of this increase would be small. In 1967 there were 300 million acres of harvested croplands in the United States of which 130 million acres are in the 17 Western States. As pointed out in Table 13 (p. 225), there are 338 million acres of land not now used for crops that could be brought into production at low cost to meet future food and fiber needs of 1980 and 2000. There is no evidence that these lands will be needed in the foreseeable future.

The impact on the economies of the 11 Western States would not be large because only 0.1 million acres of Forest Service L.U. lands are located in these States. The remaining 0.5 million acres (mostly drylands) are located in the western parts of the Great Plains States and were outside the scope of the requested study.

LOCATION OF FEDERAL LANDS


WASHINGTON
OREGON
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
MINN.
WISCONSIN
MICH.
NEW YORK
VT.
N.H.
MAINE
MASS.
CONN.
PENNSYLVANIA
IDAHO
WYOMING
NEBRASKA
IOWA
ILLINOIS
IND.
OHIO
W. VA.
VIRGINIA
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
KENTUCKY
NORTH CAROLINA
TENNESSEE
SOUTH CAROLINA
CALIFORNIA
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
MISS.
ALABAMA
GEORGIA
LOUISIANA
TEXAS
FLORIDA
▨ GRAZING DISTRICTS
NATIONAL FORESTS
● NATIONAL WILDLIFE REFUGES
▩ NATIONAL PARKS AND MONUMENTS
▭ BOUNDARIES ENCLOSING O AND C LANDS

Source: Clawson & Held, The Federal Lands

Note: This chart shows the location of the bulk of public lands described in Section 10 of the Public Land Law Review Commission Act of 1964, but is not limited thereto.

Table 1.--Estimated total acreage of federal public lands suitable for intensive agriculture controlled by seven agencies in the 17 Western States, by States

State	Public lands total acres	A Dryland acres	B Irrigable (water avail.) acres	C Irrigable (water not avail.) acres
Arizona	33,033,826	0	10,775	7,145,106
California	44,676,678	172,216	136,877	6,128,681
Colorado	23,021,905	103,420	87,795	298,120
Idaho	31,586,491	84,895	313,777	2,622,642
Kansas	588,981	99,415	43,000	210
Montana	26,914,155	279,160	5,600	13,270
Nebraska	636,420	9,599	4,900	26,454
Nevada	60,639,011	3,805	6,894	9,915,714
New Mexico	26,100,312	203	11,443	2,921,542
North Dakota	2,154,276	261,665	4,412	3,700
Oklahoma	1,154,838	43,762	3,485	44,891
Oregon	29,617,935	67,142	72,057	625,301
South Dakota	3,294,588	236,564	46,176	96,868
Texas	2,338,738	149,140	6,205	189,542
Utah	35,217,787	634	13,621	2,557,340
Washington	13,817,828	14,884	158,230	41,870
Wyoming	30,656,139	469,100	387,392	2,436,790
	365,449,908	1,995,604	1,312,639	35,068,041

Note: Agencies with their total acreages are shown in Table 3.

Table 2.--Estimated total acreage of federal public lands suitable for intensive agriculture in the 17 Western States, by Agency

Administered by	A Dryland Acres	A Dryland Percent[a]	B Irrigable (water avail.) Acres	B Irrigable (water avail.) Percent[a]	C Irrigable (water not avail.) Acres	C Irrigable (water not avail.) Percent[a]
Bureau of Reclamation	22,972	0.25	423,936	4.72	370,725	4.13
Bureau of Land Management	569,320	0.32	516,265	0.30	28,449,555	16.26
National Parks	21,383	0.15	4,816	0.03	696,100	4.89
Sport Fisheries and Wildlife	82,940	1.60	114,367	2.20	58,451	1.13
Forest Service	842,439	0.60	100,830	0.07	932,750	0.67
Department of Defense	343,650	1.81	151,425	0.79	4,549,860	23.92
Corps of Civil Engineers	112,900	3.07	1,000	0.03	10,600	0.29
Totals	1,995,604		1,312,639		35,068,041	
National Grasslands and/or L.U. lands[b]	509,880	8.39	115,006	1.89	537,581	8.70

[a] Percentage of total lands administered in specified category.

[b] Acres and percentages have been included in Bureau of Land Management and/or Forest Service figures.

State	Bureau of Land Management--L.U. Lands Total 1964	Dryland	Irrigable Water Avail.	Irrigable No Water	Forest Service--National Grasslands Total 1964	Dryland	Irrigable Water Avail.	Irrigable No Water
	- - - - - -	- - - - - -	- - - - - -	1,000 acres	- - - - - -	- - - - - -	- - - - - -	- - - - - -
Arizona	39	0	0	39	0	0	0	0
California	0	0	0	0	0	0	0	9
Colorado	38	0	0	0	612	0	0	140
Idaho	73	5	15	50	48	0	0	20
Kansas	0	0	0	0	107	43	43	0
Montana	1,925	41	0	2	0	0	0	0
Nebraska	0	0	0	0	94	0	0	20
Nevada	3	0	0	1	0	0	0	0
New Mexico	233	0	0	24	134	0	4	2
North Dakota	0	0	0	0	1,105	184	0	0
Oklahoma	0	0	0	0	47	0	3	2
Oregon	95	0	0	10	103	0	0	1
South Dakota	0	0	0	0	864	186	45	80
Texas	0	0	0	0	117	1	5	4
Utah	33	0	0	10	0	0	0	0
Washington	0	0	0	0	0	0	0	0
Wyoming	10	0	0	0	573	50	0	125
Totals	2,449	46	15	136	3,804	464	100	403

Sources: The 1964 totals are from H.H. Wooten, Land Utilization Programs, 1934 to 1964, U.S. Dept. Agriculture, ETS Agr. Econ. Report 85 (1965) Tables 13-14. The National Grasslands are former L.U. Lands.

Table 4.--Arizona: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	1,389,957	0	---	6,000	$ 405	105,100
Bureau of Land Management	12,925,990	0	---	0	---	4,700,000
National Park Service	2,098,512	0	---	220	75	430,006
Sport Fisheries and Wildlife	1,599,361	0	---	4,375	450	6,000
Forest Service	11,377,229	0	---	180	1,500	20,000
Department of Defense	3,608,969	0	---	0	---	1,879,000
Corps of Civil Engineers	33,808	0	---	0	---	5,000
Total	33,033,826	0	---	10,775	---	7,145,106
National Grasslands/ L. U. lands[a]	38,832	0	---	0	---	38,832

Sources: (9), (10), (11), (60), (61)

[a]Included in Bureau of Land Management and/or Forest Service figures.

Table 5.--California: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	1,121,136	4,110	$150	20,260	450-$1,000	140,620
Bureau of Land Management	16,815,998	0	---	0	---	4,400,000
National Park Service	4,119,390	1,716	395	1,516	690	1,716
Sport Fisheries and Wildlife	78,895	1,118	---	27,101	---	13,495
Forest Service	18,754,900	272	---	0	---	17,850
Department of Defense	3,709,735	165,000	---	88,000	---	1,555,000
Corps of Civil Engineers	76,624	0	---	0	---	0
Total	44,676,678	172,216	---	136,877	---	6,128,681
National Grasslands/ L. U. lands[a]	19,115	0	---	0	---	9,000

Sources: (12), (62), (63), (64), (65)

[a]Included in Bureau of Land Management and/or Forest Service figures.

Table 6.--Colorado: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	806,266	2,000	$ ---	13,449	$300	0
Bureau of Land Management	8,294,635	101,420	20-100	72,420	150-295	121,820
National Park Service	87,297	0	---	0	---	17,000
Sport Fisheries and Wildlife	24,424	0	---	1,926	---	3,300
Forest Service	13,544,583	0	---	0	---	140,000
Department of Defense	238,496	0	---	0	---	16,000
Corps of Civil Engineers	26,204	0	---	0	---	0
Total	23,021,905	103,420	---	87,795	---	298,120
National Grasslands/ L. U. lands[a]	612,189	0	---	0	---	140,000

Sources: (13), (14), (66), (68), (69), (70), (71), (72)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 7.--Idaho: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	453,046	200	---	146,240	$400	0
Bureau of Land Management	11,957,000	82,800	$ 45-100	160,100	---	2,474,200
National Park Service	53,630	20	300	20	400	20
Sport Fisheries and Wildlife	50,513	1,492	40-150	7,192	100-600	122
Forest Service	18,341,510	383	130	225	---	28,300
Department of Defense	691,035	0	---	0	---	120,000
Corps of Civil Engineers	39,757	0	---	0	---	0
Total	31,586,491	84,895	---	313,777	---	2,622,642
National Grasslands/ L. U. lands[a]	120,599	5,000	---	15,006	---	70,000

Sources: (15), (16), (17), (18), (19), (59), (73)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 8.--Kansas: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	Arable lands (dryland)		Irrigable lands (water avail.)		Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	17,173	1,765	$200	0	---	0
Bureau of Land Management	1,511	0	---	0	---	0
National Park Service	1,156	150	---	0	---	210
Sport Fisheries and Wildlife	39,700	2,500	130	0	---	0
Forest Service	107,255	43,000	100	43,000	250	0
Department of Defense	163,808	27,600	150	0	---	0
Corps of Civil Engineers	258,378	24,400	60	0	---	0
Total	588,981	99,415	---	43,000	---	210
National Grasslands/ L. U. lands[a]	107,255	43,000	---	43,000	---	0

Source: (74)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 9.--Montana: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	323,191	12,000	$110	5,200	$325	0
Bureau of Land Management	8,071,610	87,900	35	0	---	8,900
National Park Service	1,137,052	2,000	---	0	---	4,270
Sport Fisheries and Wildlife	112,001	7,260	60-500	400	300	100
Forest Service	16,609,099	165,000	75	0	---	0
Department of Defense	12,593	0	---	0	---	0
Corps of Civil Engineers	588,609	5,000	---	0	---	0
Total	26,914,155	279,160	---	5,600	---	13,270
National Grasslands/ L. U. lands[a]	1,900,637	41,000	---	0	---	1,800

Sources: (20), (21), (59)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 10.--Nebraska: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland) Acres	A Value/ acre	B Irrigable lands (water avail.) Acres	B Value/ acre	C Irrigable lands (water not avail.) Acres
Bureau of Reclamation	66,907	600	---	1,000	---	0
Bureau of Land Management	7,948	100	---	0	---	600
National Park Service	4,321	550	---	0	---	600
Sport Fisheries and Wildlife	74,586	4,649	---	2,200	---	54
Forest Service	349,399	0	---	0	---	20,000
Department of Defense	79,223	3,700	---	1,700	---	5,200
Corps of Civil Engineers	54,036	0	---	0	---	0
Total	636,420	9,599	---	4,900	---	26,454
National Grasslands/ L. U. lands[a]	103,985	0	---	0	---	20,000

Source: (75)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 11.--Nevada: Estimated acres and [illegible] for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland) Acres	A Value/ acre	B Irrigable lands (water avail.) Acres	B Value/ acre	C Irrigable lands (water not avail.) Acres
Bureau of Reclamation	1,171,027	0	---	2,500	$500	80,500
Bureau of Land Management	48,067,085	0	---	0	---	9,613,414
National Park Service	692,327	0	---	0	---	50,000
Sport Fisheries and Wildlife	1,700,329	80	---	654	---	2,800
Forest Service	5,062,930	0	---	15	---	4,000
Department of Defense	3,944,293	3,725	---	3,725	---	165,000
Corps of Civil Engineers	1,020	0	---	0	---	0
Total	60,639,011	3,805	---	6,894	---	9,915,714
National Grasslands/ L. U. lands[a]	3,287	0	---	0	---	600

Sources: (22), (23), (24), (59)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 12.--New Mexico: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	197,842	0	---	0	---	5,000
Bureau of Land Management	13,682,908	0	---	0	---	2,233,201
National Park Service	239,645	0	---	0	---	13,921
Sport Fisheries and Wildlife	146,835	203	$150	7,054	$150-550	2,420
Forest Service	8,922,268	0	---	4,389	---	67,000
Department of Defense	2,897,488	0	---	0	---	597,400
Corps of Civil Engineers	13,326	0	---	0	---	2,600
Total	26,100,312	203	---	11,443	---	2,921,542
National Grasslands/ L. U. lands[a]	361,353	0	---	4,000	---	26,009

Sources: (25), (26)

[a] Included in Bureau of Land Management and/or Forest Service figures.

for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	58,706	0	---	0	---	0
Bureau of Land Management	75,785	3,800	---	0	---	0
National Park Service	69,000	5,760	---	0	---	0
Sport Fisheries and Wildlife	283,666	39,135	$80-155	4,412	$60-275	3,700
Forest Service	1,104,958	183,680	---	0	---	0
Department of Defense	12,174	10,790	---	0	---	0
Corps of Civil Engineers	549,987	18,500	---	0	---	0
Total	2,154,276	261,665	---	4,412	---	3,700
National Grasslands/ L. U. lands[a]	1,104,958	183,680	---	0	---	0

Sources: (27), (79)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 14.--Oklahoma: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	73,158	325	---	0	---	35
Bureau of Land Management	17,868	1,200	---	0	---	1,000
National Park Service	6,558	500	$110	0	---	1,100
Sport Fisheries and Wildlife	115,829	4,237	190-350	485	$400-500	2,876
Forest Service	46,838	0	---	3,000	150	1,500
Department of Defense	182,688	36,500	---	0	---	36,380
Corps of Civil Engineers	711,899	1,000	---	0	---	2,000
Total	1,154,838	43,762	---	3,485	---	44,891
National Grasslands/ L. U. lands	46,838	0	---	3,000	---	1,500

Source: (80)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 15.--Oregon: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	147,573	535	$100	22,540	$325	11,500
Bureau of Land Management	13,573,038	59,100	---	0	---	537,600
National Park Service	160,890	10	300	0	---	0
Sport Fisheries and Wildlife	534,298	4,837	200-700	49,517	525	14,101
Forest Service	15,039,602	2,660	70-100	0	---	62,100
Department of Defense	67,567	0	---	0	---	0
Corps of Civil Engineers	94,967	0	---	0	---	0
Total	29,617,935	67,142	---	72,057	---	625,301
National Grasslands/ L. U. lands[a]	184,522	0	---	0	---	11,200

Sources: (28), (29), (82)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 16.--South Dakota: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	value/ acre	Acres
Bureau of Reclamation	45,769	0	---	0	---	0
Bureau of Land Management	277,900	30,000	$ 50	0	---	3,000
National Park Service	142,141	1,000	$50-75	0	---	5,000
Sport Fisheries and Wildlife	62,404	8,729	---	1,176	---	5,168
Forest Service	1,979,148	186,000	60-150	45,000	---	80,000
Department of Defense	268,440	9,835	---	0	---	2,700
Corps of Civil Engineers	518,786	1,000	---	0	---	1,000
Total	3,294,588	236,564	---	46,176	---	96,868
National Grasslands/ L. U. lands[a]	856,691	186,000	---	45,000	---	80,000

Sources: (31), (83)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 17.--Texas: Estimated acres and values of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	61,504	0	---	0	---	0
Bureau of Land Management	0	0	---	0	---	0
National Park Service	945,621	0	---	0	---	135,547
Sport Fisheries and Wildlife	142,603	6,440	$135-330	1,205	$250-400	1,715
Forest Service	117,269	1,200	---	5,000	---	4,000
Department of Defense	458,335	80,500	---	0	---	48,280
Corps of Civil Engineers	613,406	61,000	70-200	0	---	0
Total	2,338,738	149,140	---	6,205	---	189,542
National Grasslands/ L. U. lands[a]	117,269	1,200	---	5,000	---	4,000

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 18.--Utah: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	1,671,113	0	---	1,100	$450	500
Bureau of Land Management	22,994,469	0	---	0	---	2,415,000
National Park Service	620,438	527	$30	0	---	27,640
Sport Fisheries and Wildlife	90,587	0	---	2,500	250	300
Forest Service	7,937,673	107	---	21	---	3,000
Department of Defense	1,903,507	0	---	10,000	---	110,900
Corps of Civil Engineers	0	0	---	0	---	0
Total	35,217,787	634	---	13,621	---	2,557,340
National Grasslands/ L. U. lands[a]	18,966	0	---	0	---	9,640

Sources: (32), (33), (34), (84), (85)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 19.--Washington: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland)		B Irrigable lands (water avail.)		C Irrigable lands (water not avail.)
		Acres	Value/ acre	Acres	Value/ acre	Acres
Bureau of Reclamation	446,502	1,337	$225	102,800	$475	0
Bureau of Land Management	273,647	0	---	0	---	25,000
National Park Service	1,229,520	6,150	---	3,060	---	5,070
Sport Fisheries and Wildlife	82,111	2,260	200-800	3,370	525-900	800
Forest Service	10,937,553	137	---	0	---	0
Department of Defense	756,529	3,000	---	48,000	---	11,000
Corps of Civil Engineers	91,996	2,000	---	1,000	---	0
Total	13,817,828	14,884	---	158,230	---	41,870
National Grasslands/ L. U. lands[a]	725	0	---	0	---	0

Sources: (35), (59), (86)

[a] Included in Bureau of Land Management and/or Forest Service figures.

Table 20.--Wyoming: Estimated acres and value of federal public lands suited for intensive agriculture, 1968

Agency	Total acres	A Arable lands (dryland) Acres	A Value/ acre	B Irrigable lands (water avail.) Acres	B Value/ acre	C Irrigable lands (water not avail.) Acres
Bureau of Reclamation	946,407	100	---	102,847	$300	27,470
Bureau of Land Management	17,870,000	203,000	---	283,745	---	1,915,820
National Park Service	2,605,544	3,000	---	0	---	4,000
Sport Fisheries and Wildlife	38,255	0	---	800	---	1,500
Forest Service	9,167,561	260,000	---	0	---	485,000
Department of Defense	28,372	3,000	---	0	---	3,000
Corps of Civil Engineers	0	0	---	0	---	0
Total	30,656,139	469,100	---	387,392	---	2,436,790
National Grasslands/ L. U. lands[a]	582,185	50,000	---	0	---	125,000

Sources: (36), (59)

[a] Included in Bureau of Land Management and/or Forest Service figures.

B. POTENTIAL CONTRIBUTION OF FEDERAL PUBLIC LANDS TO FOOD AND FIBER NEEDS, 1980 and 2000.

INTRODUCTION

It is common knowledge that the world's population is increasing at an unprecedented pace. Food supply has become a major world problem particularly in the underdeveloped countries and is also a matter of concern in the developed countries where population is increasing at a slower rate and agricultural productivity is high. In view of these trends and the expected demand for food, what is the potential contribution of the federal public lands to future food and fiber needs?

Total non-federal, non-urban cropland of varying quality totals 638 million acres in the 50 States. About 336 million acres are now in use, and 80 million additional acres could be returned to use in a short time. Urbanization is using approximately 200,000 acres of cropland per year.[1] Federal public lands comprise 371 million acres in 17 Western States. However only 3.3 million acres are classed as presently arable for either dry or irrigated farming. Another 35 million acres are considered irrigable, but water is not now either legally or physically available for them.

The purpose of this report is to assess the potential role of federal public lands in satisfying future food and fiber needs by reviewing (1) the projected trends in population, (2) the projected food and fiber needs, (3) the acres of cropland that will be required to produce the food and fiber needed, and (4) the potential contribution of the federal public lands to these needs. This analysis assumes that the maximum national public benefit in strictly economic terms will be achieved if food and fiber needs are met at least cost.

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[1] *Food & Fiber for the Future*, report of the National Advisory Commission on Food and Fiber (Washington, D.C.: U.S. Government Printing Office, 1967), pp. 243-245.

FUTURE POPULATION PROJECTIONS AND FOOD AND FIBER NEEDS, 1980 and 2000

Other things being equal, the demand for food varies directly with the number of people. If world population doubles by 2000, food requirements will also double--especially in those areas of the world where food is barely sufficient to maintain life. With rising incomes the resulting increase in demand for food will probably mean that world supplies will need to increase by two and a half to three times. Hence any study of the future demand for food must begin with a study of population prospects or trends.

World Population and Food and Fiber Needs

If present trends continue, world population is expected to double by the year 2000. In 1965 it was estimated to be 3.3 billion, and the medium projection for the year 2000 is 6.0 billion (Table 1). The most rapid increases are taking place in Asia, Africa, and Latin America, areas of the world least able to bring their burgeoning population into balance with their food supplies. Asia had 1.8 billion people in 1965--56 percent of the total world population. If current trends continue, even the medium projections indicate increases of 30 percent by 1980 and 80 percent by 2000. African population is expected to increase 60 percent by 1980 and 150 percent by 2000, and in Latin America anticipated increases are 50 percent by 1980 and 150 percent by 2000. In contrast, population increases in Europe will probably be only about 10 percent by 1980 and 20 percent by 2000.

The rapid population increases expected in Asia, Africa, and Latin America are largely due to health and sanitation improvements which have reduced infant mortality and increased longevity. These desirable measures introduced by the United Nations, national governments, and private organizations have had the ironic effect of preventing death by disease but increasing the likelihood of malnutrition and death by starvation. It is now being recognized that malnutrition, particularly during infancy, may have most serious effects on mental as well as on physical ability.

Table 1.--Major world area population estimates for 1965 and medium projections for 1980 and 2000

Area	Estimate mid-1965	Medium projections 1980	Medium projections 2000	Increase over 1965 1980	Increase over 1965 2000
	- - - - - Millions	- - - - -	- - - - -	- - - Percent	- - -
Africa	311	449	768	63	147
Asia (total)	(1,842)	(2,404)	(3,307)	(30)	(80)
East Asia	867	1,038	1,284	20	48
South Asia	975	1,366	2,023	40	107
Europe	443	479	527	8	19
Latin America	248	374	624	51	152
North America	215	262	354	22	65
Oceania	17	23	32	35	39
U.S.S.R.	234	278	353	19	51
World total	3,308	4,269	5,965	29	80

Source: Population Bulletin (October 1965), p. 96.

The National Advisory Committee on Food and Fiber notes that the developing regions not only have two-thirds of the world population but that their populations are growing at almost twice the rate of developed countries with adequate diets. Furthermore, the Committee declares "if current trends in population, food demand and production continue, by 1980, the food deficit of the developing regions could be too large for the physical and financial capabilities of the developing regions to overcome it."[2]

In this dismal situation, food aid programs may be only a short-run palliative. Unless these programs are used with care, they can ruin market prices for native farmers and thereby discourage increased production. Food aid can also mask the need for population control and food production in the underdeveloped countries. But even effective efforts to control population and produce food may be too late to forestall severe pressure on supplies, and food aid will still be needed in increasing amounts to prevent famines such as recently ocurred in India as a result of drought. But in the long run these countries must produce most of their own food or purchase it on world markets. (Trends in world food production per capita are shown in Figure 1.)

In some cases food aid can be used in underdeveloped countries to good advantage as incentive payments for labor in the construction of farm-to-market roads and other similar projects that will help the people become more self-sufficient. In general, aid should be centered on providing and developing teaching, training, research, and demonstration institutions. New capital for agriculture should also be emphasized. Seeds, fertilizers, insecticides, hand tools, and machinery are examples of pressing needs. In the short run, capital may have to come from foreign sources, but as soon as possible it should be provided by the peoples themselves with the aid and assistance of their governments.[3]

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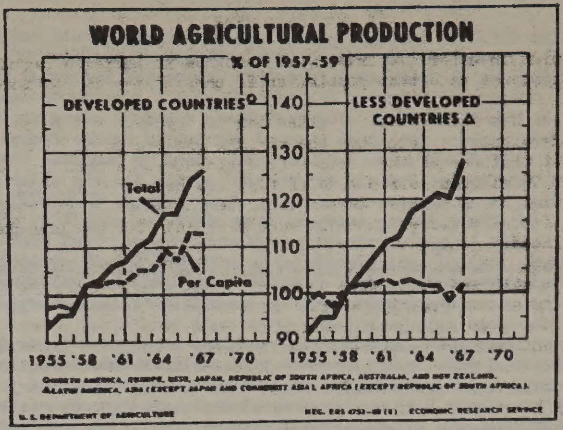
[2] Food & Fiber for the Future, National Advisory Commission on Food and Fiber, p. 306.

[3] Rutillis H. Allen, "The Role of Agriculture in World Economic Development," Agriculture and Foreign Economic Development, Technical Papers, Vol. VII, National Advisory Commission on Food and Fiber (1967), pp. 1-33.



○NORTH AMERICA, EUROPE, USSR, JAPAN, REPUBLIC OF SOUTH AFRICA, AUSTRALIA, AND NEW ZEALAND.
△LATIN AMERICA, ASIA (EXCEPT JAPAN AND COMMUNIST ASIA), AFRICA (EXCEPT REPUBLIC OF SOUTH AFRICA).

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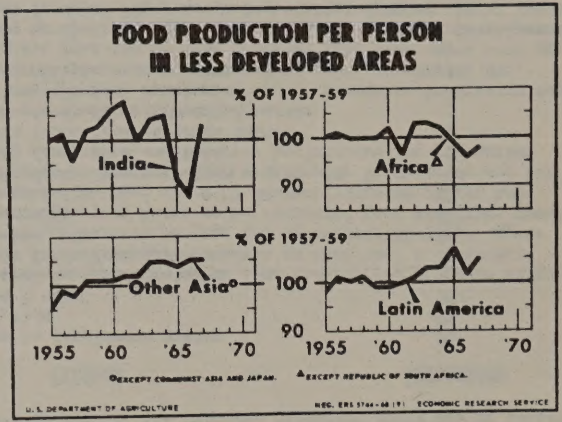

○EXCEPT COMMUNIST ASIA AND JAPAN. △EXCEPT REPUBLIC OF SOUTH AFRICA.

U. S. DEPARTMENT OF AGRICULTURE NEG. ERS 5744-68 (9) ECONOMIC RESEARCH SERVICE

Figure 1

New Low Cost Foods

Crop yields in other countries will continue to increase rapidly, although at a slower pace than population, if present trends continue.

Arthur and others have called attention to new low-cost foods that may be developed to help feed the world's growing population.[4] They point out that one of the serious food shortages is protein. At present, about 50 million metric tons of fish are harvested yearly, but it is estimated that this harvest could be increased to 250 million metric tons if more efficient methods were used and fish now unmarketable are utilized.

Synthetic milk and meats from soybean, peanut, sunflower, and safflower proteins may greatly improve efficiency in production of needed proteins. Feeding these products to livestock in order to produce milk and meat is relatively inefficient.

A fish protein concentrate (FPC) that is virtually odorless and tasteless may be an inexpensive way of providing needed proteins when added to conventional foods such as stews, soups, tortillas, and bread.

A new rice variety (IRI-8) could double the world's rice production in the next 10 years. By the year 2000, production may have increased many times.

A new field corn (Opaque 2) is capable of producing most of the amino acids that the body needs. General use of such a corn might greatly reduce malnutrition in Latin America where corn is a staple food.

Lysine, an amino acid derived from fermented molasses, is a promising new food supplement that can be added to conventional foods to provide proteins almost equal to those in milk and meat.

Yeasts, used during World War II in Germany, are also a promising source of protein although somewhat deficient in amino acids. Other micro-organisms can also be used such as fungi imperfecti which synthesize proteins from products like blackstrap molasses, sweet potatoes, and corn starch.

Algae farming is an especially promising source of foods and feeds for the future. Algae are most efficient converters of solar energy into foods and produce yields 20 to 40 times greater than most farm crops. They are high in protein, but not so high as meat and fish; they are also fairly high in vitamins. Production costs are estimated to be $40 to $100 per ton of 50 percent protein food, a cost that compares favorably with soybean proteins.

There are a number of other possibilities for developing foods for the future. Arthur and others suggest that in the years ahead food may come from such strange sources as petroleum, methane gas, and chemical synthesis.[5] Their estimates of the probability of commercial success by 1980 of the products discussed above are as follows:

Product	Percentage
Lysine to supplement grains	95
IRI-8 rice	95
Opaque 2 corn	90
Fish protein concentrates	95
Protein foods from soybeans, peanuts, etc.	80
Soybean milk	60
Fungi proteins	20
Protein foods from petroleum	3
Protein foods from sea water	5
Protein foods from sewerage wastes	7
Protein foods from industrial wastes	5
Plankton, chemical synthesis and synthetic energy compounds	½

Perhaps by the year 2000 other possibilities will have been developed to meet food and fiber needs beyond that date.

Foreign Demand for U.S. Food and Fiber

Despite the rapidly growing populations in the developing countries, the strongest export markets for U.S. food and fiber are still found in the developed countries (Figure 2). In 1968, Japan was our best commercial market for agricultural exports. Canada, the Netherlands, the United Kingdom, West Germany, and Italy followed in that order. India took $500 million worth of farm products, but these were all under U.S. government programs. Pakistan and South Vietnam also received considerable government-sponsored farm exports.

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[4] H. B. Arthur, R. A. Goldberg and K. M. Bird, The United States Food and Fiber System in a Changing World Environment, Technical Papers, Vol. IV, National Advisory Commission on Food and Fiber, p. 58.

[5] Ibid., pp. 58-59.

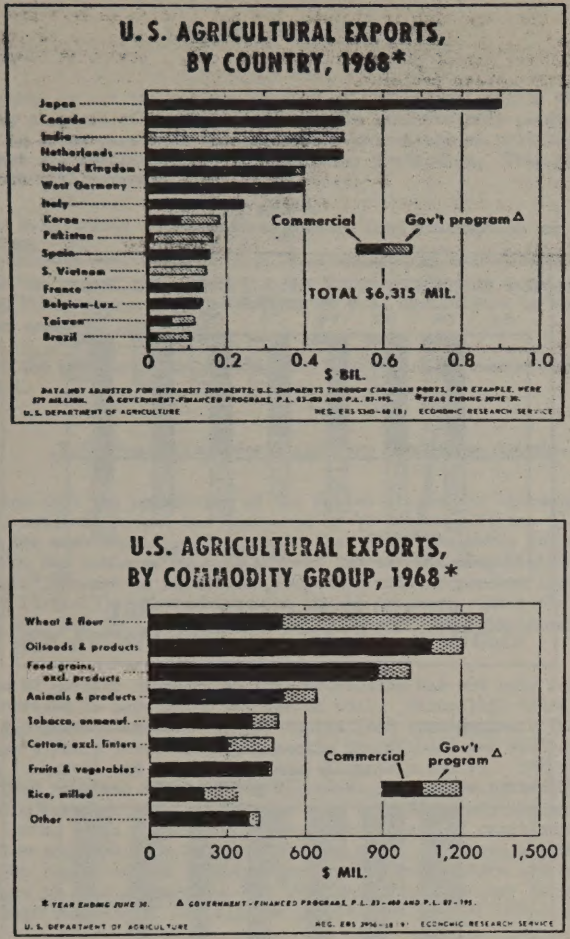


Figure 2

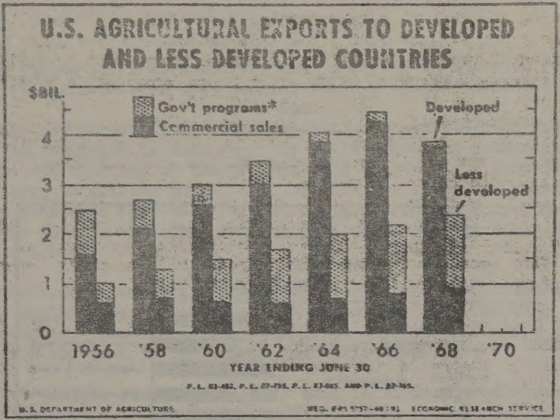
In the United States, total cropland harvested fell from 324 million .cres to about 300 million during the last decade. At the same ime, croplands harvested for export increased from about 50 million to '5 million acres—50 percent. Farm exports are expected to remain trong and even increase in years ahead, but this increase is not xpected to be great enough to warrant concern about our capacity to roduce the foods demanded at home. Exports tend to be the surplus fter domestic needs are met and to this extent are not competitive with ocal markets. The role of government programs in present major food xports is shown in Figure 3. While such programs probably will be ontinued, the vast food needs of developing countries can be transormed into effective demand only over a relatively long period. Their se of our farm products for the next 30 years will probably depend eavily on foreign aid policies pursued by the United States.

Thus the primary concern is whether future domestic demands for ood and fiber warrant the development of the remaining federal public ands for dry or irrigated crop production at this time. Since populaion in underdeveloped countries threatens to outrun food supply, will opulation in the United States also outrun our capacity to produce?

Future U.S. Population and Food Needs

Despite the steady population increase in the United States there as been no food shortage in this country. Price-depressing surpluses f foods and fibers have led to farm programs that have idled over 60 illion acres of cropland. Since 1950 total food consumption has acreased more rapidly than population. (U.S. trends in population and ood production are shown in Figure 4.)

But what of the future? Population projections for the United tates are presented in Table 2. The medium-high projections are for 25 percent increase by 1980 and a 75 percent increase by the year 00. If these projections prove to be accurate, food and fiber needs ill also increase 25 percent by 1980 and 75 percent by 2000. These eeds can be met by a comparable increase in cropland, a comparable acrease in yields, by imports, or by some combination of these methods.



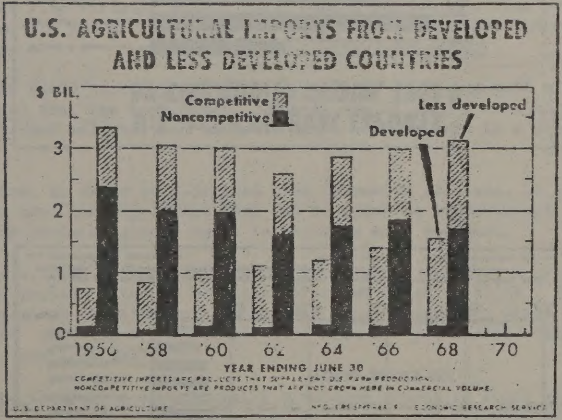


Figure 3

Table 2.--Estimated population of the United States for 1965 with projections for 1980 and 2000

Year and level	Population estimate (millions)	Increase over 1965 (percent)
1965 estimate	193.8	—
1980 projections		
Low	227.7	17
Medium-low	235.2	21
Medium-high	243.3	26
High	250.5	29
2000 projections		
Low	282.6	46
Medium-low	307.8	58
Medium-high	336.0	73
High	361.4	86

Sources: U.S. Department of Commerce, Population Estimates, Bureau of the Census, Series P-25, No. 375 (3 October 1967), p. 18; Series P-25 No. 381 (18 December 1967), pp. 76, 77, 94, 95.

U.S. PRIVATE CROPLANDS: CAN THEY MEET FOOD AND FIBER NEEDS OF 1980? 2000?

Whether or not the maximum benefit of the general public will be served by disposal of arable federal public land for crop production depends in large part upon the production potentials of privately owned lands that are available for food and fiber production. This part of the report will review:

(a) U.S. trends in population growth, food consumption and production;

(b) the recent study made for the National Advisory Commission on Food and Fiber concerning the ability of U.S. agriculture to meet food and fiber needs of 1980; and

(c) the prospects for meeting the food and fiber needs of the year 2000.

U.S. Population Growth and Farm Production Trends

Since 1950 the population of the United States has increased by 32 percent, but farm output has increased by 42 percent (Figure 5). Perhaps the most significant point is that this remarkable increase in production was achieved by a 52 percent increase in crop yields and a 34 percent increase in livestock production with 10 percent less cropland (Table 3). The achievement is all the more remarkable since between 1955 and 1967, acreage devoted to export crops increased from 47 million to 71 million, or 50 percent.

The 42 percent increase in farm production has not only fed the sharp increase in population but fed it well. Since 1950 there has been a 4.5 percent increase in per capita food consumption. There has also been a sharp increase in per capita use of beef and veal and a decline in cereal and bakery products (Figures 6 and 7). The result is a diet that requires considerably more farm production either by increasing acres or yields. Despite a 32 percent population growth, better diets, and a 50 percent increase in acreage of crops exported, the nation has been able to meet the food needs that have arisen since 1950. But reassuring as this performance has been, there are new challenges to food production. By 1980 the population may rise to the high estimate of 243 million people-- 25 percent above the 1965 level.

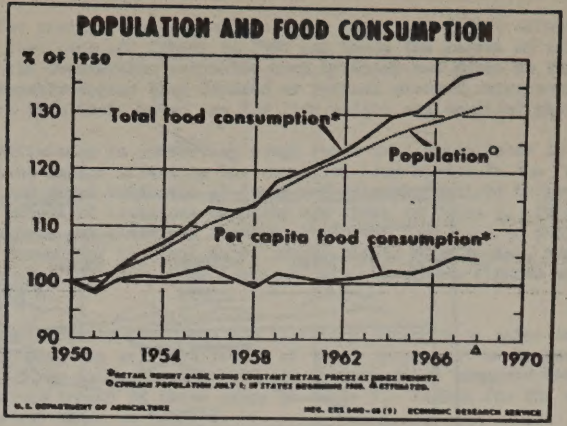


Figure 4

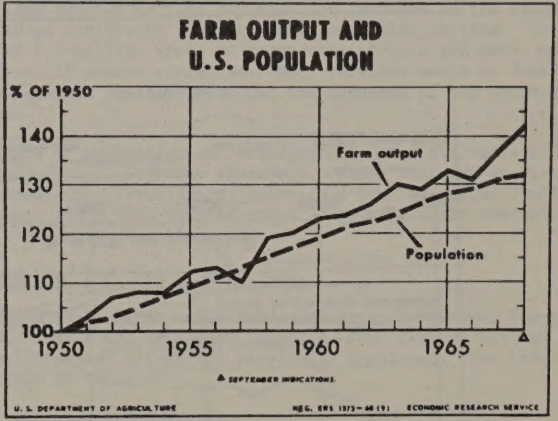


Figure 5

Table 3.--Trends in population and crop and livestock production, United States, 1950-1968

	1950	1955	1960	1965	1968
	- - - - - - - - Index numbers - - - - - - -				
U.S. population	100	109	119	128	132
Farm output	100	112	123	133	142
Livestock production	100	112	116	126	134
Crop production	100	108	121	129	137
Crop production per acre	100	108	130	145	152
Cropland used for crops	100	100	93	89	90

Source: U.S. Department of Agriculture Handbook of Agriculture Charts 1968, p. 10.

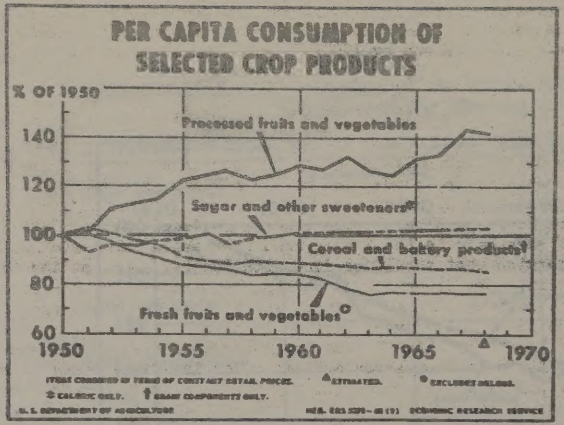


Figure 6

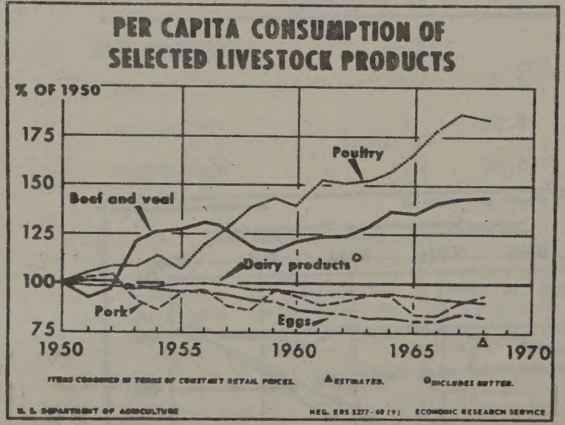


Figure 7

Given expected trends in crop yields and per capita consumption, would this increase in population, plus increased foreign demand, exhaust the supply of idle cropland by 1980?

U.S. Agriculture and Food Needs, 1980

Whether or not agriculture in the United States can meet the food and fiber demands of the population of 243 million expected by 1980 has been recently studied by Heady and Mayer for the National Advisory Commission on Food and Fiber.[6] Their work, reviewed here in detail, should be of much help to the Public Land Law Review Commission as it seeks to determine what should be done with federal lands suited to crop production. The study could not have been made without a powerful tool, a multi-regional linear program, which Heady and Mayer used for the 144 producing and 31 demand regions involved. The authors studied four alternative "free market" farm programs (models) and found that an excess of 47 to 78 million acres existed under the first three plans so that only "a policy of exporting all quantities of major crops above domestic needs which the agricultural sector is able to produce" would exhaust the nation's excess capacity of 56 million acres of idle land by 1980. Heady and Mayer concluded that "given any policy other than all-out production, it is evident from the models analyzed that the agricultural economy will continue to have surplus capacity for the forseeable future."[7]

The authors note that "unless society changes its views on what constitutes equitable returns to landowners, it is probable that programs for removing land from production will continue." Therefore, they analyzed models of three "controlled market" farm programs that involve restrictions on crop production. Their analysis revealed excess capacity with 45 to 71 million acres of idle land.

Consumption Rates and Total Demand

Obviously the number of acres of land that were found to be idle depends not only upon the population expected (243.4 million) but also upon per capita consumption, feeds required to produce livestock products consumed, expected level of exports, and finally, expected crop yields.

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[6] Earl O. Heady and Leo V. Mayer, Food Needs and U.S. Agriculture in 1980, Technical Papers, Vol. I, National Advisory Commission on Food and Fiber, p. 63.

[7] Ibid., p. 70.

Per capita food consumption is an important factor affecting the needs for foods and fibers in 1980 and hence the amount of idle acres. Since the consumption estimates used by Heady and Mayer in Table 4 are considerably higher than dressed or refined product rates would be, it appears that their rates are for live weight and unmilled grains.

Efficiency in converting rough feeds into human foods is also an important factor affecting the amount of land needed in the future. The Heady and Mayer estimates of feeds and oilmeal required to produce 1,000 pounds of livestock products are shown in Table 5. These human consumption and livestock feeding rates were then used to project the total demand for the four major crops--wheat, feed grains, soybeans and cotton--to 1980 under four levels of export. These figures are shown in Table 6.

To translate the human and livestock consumption rates into acres of cropland, the expected yields of these crops must be estimated. The Heady--Mayer estimates for 1980 are presented and compared with historical trends of these crops in Table 7. Yields for the various States are shown in Table 8.

The maximum cropland available for these seven major crops--wheat, corn, oats, barley, sorghum, and cotton--was assumed to be equal to the maximum acreages which have been harvested in past years. For example, in 1965 the harvested and idled acres of these seven crops was 252 million. Although 56 million acres were idle, they could easily be brought back into production if needed.

Lands devoted to tame hay were not included in the study. Other minor crops and fruits and vegetables were also omitted. In 1967, a total of 6.6 million acres of vegetables, fruits and nuts was harvested. Therefore, if demand warranted, their acreages could be doubled or tripled without greatly affecting the acreages of the seven major crops studied.

Costs of production and transportation for the various crops were also projected to 1980 for the study. These included machinery, power, seed, chemicals, fertilizers, labor, and similar costs. Land and management costs were omitted since they would claim the net returns after other costs had been paid.

Cropland Used and Idle Land in 1980

Using these basic rates Heady and Mayer determined the amount of cropland that would be needed under the four free market and three controlled market situations previously mentioned. The results are summarized in Table 9.

Table 4.--Estimated per capita consumption for 1964 with projection used in study of food and fiber needs for 1980

Commodity consumed	Per capita consumption 1964	Per capita consumption 1980	Increase 1950 1964	Increase 1964 1980
	- - - - Pounds	- - - -	- - Percent	- -
Livestock products				
Beef and Veal	183.8	203.5	47	11
Pork	107.5	97.0	1	-10
Lamb and Mutton	8.6	7.2	5	-16
Broilers	31.2	50.2	11	61
Turkeys	7.2	11.8	16	64
Dairy products	628.0	570.0	-5	-9
Eggs(number)	314.0	290.0	-7	-8
Grain products				
Wheat	160.0	142.8	-2	-11
Corn	53.0	51.1	1	-4
Oats	7.8	8.0	3	3
Barley	1.4	1.1	0	-22
Fiber products				
Cotton	22.1	21.6	-30	-2

Sources: Heady and Mayer, Food Needs and U.S. Agriculture in 1980, Table 3 (per capita consumption only)--these estimates are for undressed and unrefined products of farm. Statistical Abstracts of the United States 1967, p. 88 (1950 and 1964 statistics).

le 5.--Estimated feed grains and oilmeal required to produce 1,000 pounds of animal product, 1964 and 1980

ivestock fed	Feed Grains 1964	Feed Grains 1980	Oilmeals 1964	Oilmeals 1980
	- - - - - - - - -	- Pounds -	- - - - - - - -	-
and veal	1302	1417	244	315
	4666	4764	264	312
and mutton	966	973	658	571
y cattle (milk)	322	317	52	64
eys	2626	2451	(a)	(a)
and pullets (eggs)	297	234	(a)	(a)
lers	1752	1482	(a)	(a)

Source: Heady and Mayer, Food Needs, Table 4.

[a] Not estimated by class.

Table 6.--Domestic use and export of four major crops for 1965 and projected levels for 1980

Plan	Wheat bushels	Feed grains tons	Oilmeals tons	Cotton bales
	- - - - - -	- - - - - - Millions	- - - - - -	- - - - - -
Actual level, 1965				
Domestic	587	130	17	9
Export	867	29	11	4
Projected use, 1980				
Domestic	720	154	20	10
Export levels				
Actual level, 1965	867	29	11	4
Trend level, 1950-1965	1302	40	24	6
Dumping level	2157	70	37	7
Commercial level	560	36	17	5

Source: Heady and Mayer, *Food Needs*, Table 6. Figures rounded.

Table 7.--Crop yields for 1948 and 1965 with projections used in study of food and fiber needs for 1980

Crops Studied	Yields per acre 1950	1965	1980	Percentage increase 1950 1965	1965 1980
Wheat, bu.	16.5	27.2	32.3	65	19
Soybeans, bu.	21.7	24.6	29.3	13	19
Corn, bu.	38.2	73.1	99.4	91	36
Oats, bu.	34.8	50.2	59.1	44	18
Barley, bu.	27.2	43.5	48.6	60	12
Sorghum, bu.	23.4	50.0	61.8	114	24
Cotton, lbs.	26.9	53.2	75.4	98	42

Sources: *Agricultural Statistics 1965*; Heady and Mayer, *Food Needs*, Table 2.

Table 8.--Yields of major field crops, actual 1965 and projected 1980

Area	Bushels per acre												Cotton (Pounds per acre)	
	Wheat		Soybeans		Corn		Oats		Barley		Grain sorghum			
	1965	1980	1965	1980	1965	1980	1965	1980	1965	1980	1965	1980	1965	1980
United States	27.2	32.3	24.6	29.3	73.1	90.4	50.2	59.1	43.5	48.6	50.0	61.8	532	754
New York	28.0	43.6	15.0	19.2	57.0	73.4	55.0	73.0	40.0	47.5	—	—	—	—
New Jersey	35.0	41.7	23.5	28.9	68.0	90.8	37.0	44.9	48.0	59.7	—	—	—	—
Pennsylvania	34.0	39.9	24.0	26.5	65.0	79.4	46.0	60.7	48.0	48.8	—	—	—	—
Ohio	32.0	40.2	24.5	30.5	75.0	95.2	56.0	79.4	42.0	41.1	—	—	—	—
Indiana	34.0	48.5	28.0	35.4	94.0	116.1	52.0	69.6	38.0	50.2	70.0	87.1	—	—
Illinois	35.5	49.0	29.0	34.0	92.0	115.2	57.0	69.7	39.0	38.9	64.0	75.1	—	—
Michigan	33.0	45.6	23.0	28.8	62.0	87.9	49.0	65.6	30.0	51.1	—	—	—	—
Wisconsin	32.4	45.3	18.5	19.3	76.0	95.0	61.0	77.4	50.0	55.3	—	—	—	—
Minnesota	27.8	31.6	18.5	26.5	61.0	80.3	55.0	64.0	44.0	45.2	—	—	—	—
Iowa	19.0	30.2	25.5	34.3	82.0	109.2	54.0	53.3	44.0	53.3	67.0	83.2	—	—
Missouri	27.5	43.7	26.0	30.8	72.0	87.0	38.0	48.7	32.0	41.6	57.0	70.3	575	793
North Dakota	26.5	25.7	18.0	17.9	37.0	45.6	52.0	60.7	41.0	46.3	—	—	—	—
South Dakota	18.0	19.5	17.0	20.5	39.0	48.0	48.0	48.5	38.0	40.9	30.0	53.2	—	—
Nebraska	20.0	29.3	24.0	34.3	67.0	89.9	40.0	45.4	30.0	34.8	54.5	78.5	—	—
Kansas	24.0	30.0	20.0	23.3	59.0	76.4	32.0	40.8	26.5	35.9	45.0	53.4	—	—
Delaware	36.0	40.0	25.0	29.6	75.0	86.4	38.5	28.6	43.0	58.1	—	—	—	—
Maryland	33.0	36.5	27.0	32.3	74.0	84.0	46.5	57.1	43.0	51.8	—	—	—	—
Virginia	30.0	36.2	20.5	25.0	68.0	71.9	43.0	40.7	43.0	58.7	42.0	47.6	298	367
West Virginia	29.0	34.7	—	—	50.0	57.5	39.0	52.2	41.0	46.9	—	—	—	—
North Carolina	29.0	36.5	24.5	34.2	70.0	90.5	43.0	44.8	38.0	49.1	48.0	31.4	286	423
South Carolina	27.0	34.2	22.5	30.1	56.0	73.1	38.0	45.6	35.0	47.9	30.0	36.8	450	527
Georgia	29.0	39.0	20.5	26.5	51.0	71.0	41.0	56.8	31.0	49.3	34.0	37.3	460	629
Florida	—	—	26.0	28.2	44.0	64.4	38.0	54.0	—	—	—	—	313	459
Kentucky	32.0	40.3	24.0	31.2	69.0	89.8	37.0	52.0	34.0	44.2	40.0	54.9	—	—
Tennessee	28.0	35.7	23.5	31.3	52.0	68.6	39.0	48.6	28.0	39.0	41.0	52.4	634	836
Alabama	26.0	35.1	23.0	34.0	44.0	58.9	34.0	46.0	—	—	26.0	33.7	490	632
Mississippi	28.0	30.1	22.5	28.3	40.0	53.3	40.0	54.0	—	—	35.0	45.2	691	930
Arkansas	26.0	44.1	21.5	26.3	37.0	49.1	30.0	68.9	30.0	39.9	35.0	39.9	611	817
Louisiana	21.0	35.5	21.5	31.2	35.0	48.0	27.0	41.5	—	—	35.0	40.0	553	775
Oklahoma	28.0	29.8	15.5	24.4	34.0	47.6	34.0	40.2	31.0	36.1	37.0	41.2	300	448
Texas	22.5	24.6	28.0	32.4	33.0	45.1	25.0	31.0	19.0	28.9	52.0	62.1	408	583
Montana	25.6	25.9	—	—	60.0	100.3	44.0	44.9	39.0	35.7	—	—	—	—
Idaho	44.9	47.9	—	—	78.0	112.7	57.0	68.2	52.0	53.0	—	—	—	—
Wyoming	12.8	21.8	—	—	55.0	112.0	39.0	43.5	43.0	47.0	—	—	—	—
Colorado	15.7	18.6	—	—	70.0	111.3	38.0	49.0	39.5	43.8	35.5	39.1	—	—
New Mexico	24.5	27.0	—	—	55.0	84.5	37.0	61.0	46.0	73.6	65.0	76.7	690	960
Arizona	46.0	61.6	—	—	27.0	39.9	42.0	55.4	73.0	94.3	70.0	89.9	1,066	1,330
Utah	32.3	27.4	—	—	71.0	97.4	55.0	59.4	60.0	61.9	—	—	—	—
Washington	40.0	46.4	—	—	75.0	129.0	54.0	55.1	49.0	56.1	—	—	—	—
Oregon	37.4	43.9	—	—	74.0	111.9	50.0	69.9	46.0	49.0	—	—	—	—
California	26.5	34.2	—	—	84.0	129.3	44.0	53.7	51.0	72.0	73.0	97.9	1,126	1,314

Source: Heady and Mayer, Food Needs, Table 2.

Table 9.--Major crops and idle land, United States, 1965 with projections for 1980 under seven market situations

Market plan	Wheat	Feed grains	Soybeans	Cotton	Idle land
	- - - - - - - - - - - - - Millions of acres - - - - - - - - - - - - -				
Present Plan, 1965	49.3	99.0	34.6	13.6	56.0
"Free markets," 1980					
A Cotton acreage controls; exports at 1965 level	59.7	73.9	29.3	10.0	78.4
B Cotton acreage controls; exports at 1950-65 trend	69.4	81.0	42.5	11.3	47.0
C No controls; exports at 1950-65 trend	70.0	81.2	42.6	9.3	48.0
D No controls; export dumping	88.7	94.4	58.6	9.7	0.0
Controlled markets, 1980					
E Feed-grain program exports at 1950-65 trend	62.5	89.2	43.1	11.0	45.6
F Acreage quotas; exports at 1950-65 trend	63.2	96.4	42.2	11.5	38.0
G Acreage quotas; commercial exports only	42.2	93.7	33.8	10.3	71.3

Source: Heady and Mayer, Tables 7, 11, 15, 19, 23, 27, and 31. Assumes 251.2 million acres are used for these crops. Feed grains include corn, oats, barley, and sorghum. Hay and minor crops omitted.

The four free market farm programs were analyzed to provide a benchmark for the three controlled market situations that Heady and Mayer believed most likely to prevail in the future. The free market plans result in greatly expanded wheat and soybean production as compared with 1965. Feed grains production would fall by about 20 million acres unless all surpluses are dumped on the world market.

Cotton acreage quotas are assumed to be in use with Plans A and B, but the least amount of cotton is produced with no controls, as shown for Plan C and D (Table 9). This indicates that cotton cannot compete with wheat, feed grains, and soybeans in some areas and raises questions about the need for cotton acreage controls.

Idle land will increase under Plan A from 56 to 78 million acres, a 40 percent increase, unless exports exceed 1965 levels. But even when exports are projected with 1950-65 trends in Plans B and C, only eight to nine million of the 56 million acres of idle land are needed for food and fiber production.

Controlled markets achieved by feed grain programs or acreage quotas would result in the production of somewhat less wheat than under free market conditions but in more feed grains produced (compare B and C with E and F).

In any event, only Plan D which calls for greatly expanded exports in 1980 would generate enough demand to utilize the excess capacity of U.S. agriculture as represented by 56 million acres of idle land in 1965. But Plan D is undoubtedly the most unrealistic of the seven plans. Wheat would have to sell for $4.40 per bushel to attract all the idle land into production (Table 10). Under the assumptions made in this study concerning consumption, yields, and exports, it seems probable that 40 to 60 million acres of idle cropland will still be available in 1980 to help meet the food and fiber needs between 1980 and 2000.

The probable location of these idle lands under two free market plans and two controlled market plans is shown in Figure 8. Under the free market plan, lands would be idled because they are not productive enough to pay the costs involved. In contrast, government programs tend to idle land more uniformly over the country regardless of its profitability.

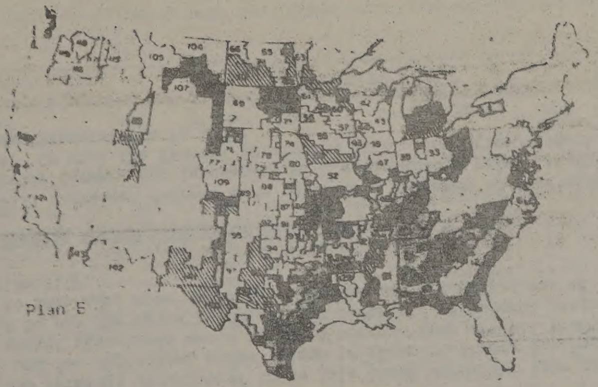
Free Markets versus Controlled Markets

Will increased demands make possible a reliance on free markets to provide farmers and landowners with satisfactory prices in the future? Or will the federal government still find price support programs irresistible in 1980?

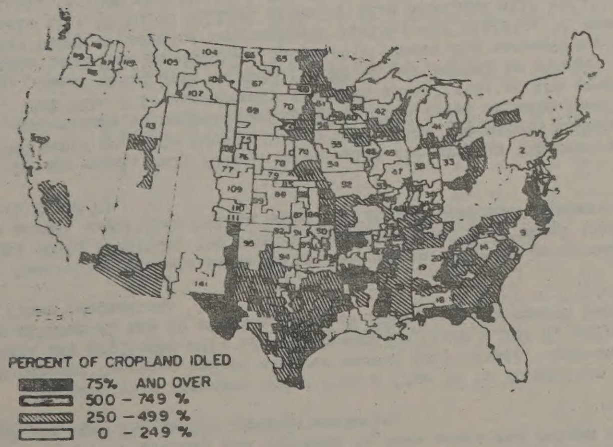
Table 10.--Prices required to secure production in the highest cost area needed to meet expected consumer demand in 1980

Market plan	Wheat bu.	Feed grains bu.	Soybeans bu.	Cotton lb.
	- - - - - - Dollars per unit - - - - - - -			
1965 (actual)	1.34	1.10	2.49	.28
"Free Market" plans				
A	1.11	.69	1.13	.26
B	1.27	.76	1.25	.27
C	1.27	.75	1.23	.17
D	4.40	2.53	6.19	.24
Controlled market plans				
E	1.49	.78	1.28	.31
F	1.92	1.48	1.19	.44
G	1.17	1.41	1.04	.41

Source: Heady and Mayer, Food Needs, Tables 8, 12, 16, 20, 24, 28, and 32.



Plan E



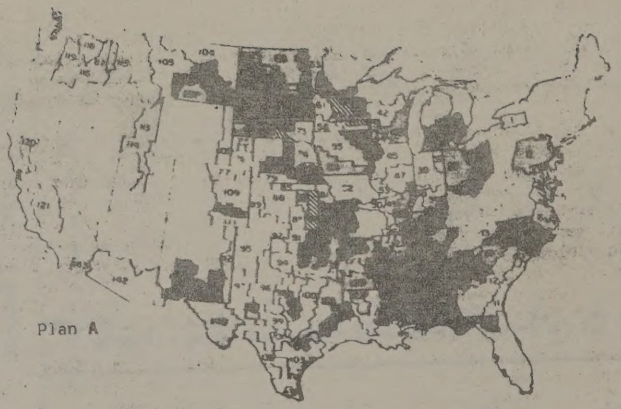
Plan F

PERCENT OF CROPLAND IDLED
75% AND OVER
500 - 749 %
250 - 499 %
0 - 249 %

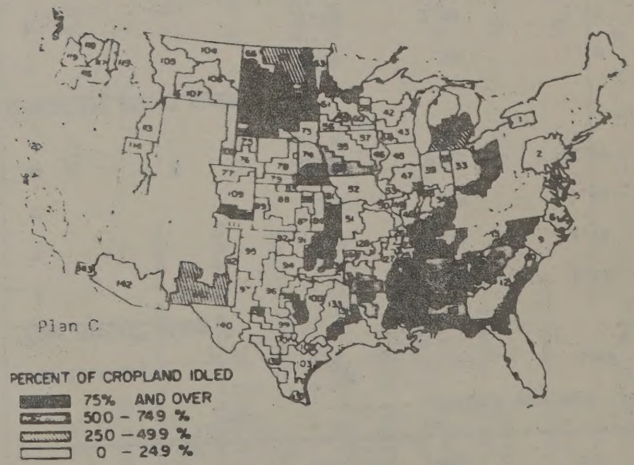
Plan E A feed grain program with trend level exports in 1980.

Plan F An acreage quota program with trend level exports in 1980.

Figure 8.--Location of idled cropland under four farm plans, 1980, continued.



Plan A



Plan C

PERCENT OF CROPLAND IDLED
75% AND OVER
500 - 749 %
250 - 499 %
0 - 249 %

Plan A A free market model 1965 level exports in 1980.

Plan C A free market without cotton quotas and with trend level exports in 1980.

Figure 8.--Location of idled cropland under four farm plans, 1980 (Source: Heady and Mayer, *Food Needs*)

The Heady-Mayer study shows that none of the three possible free market farm plans (A,B,C) would result in major crop prices as high as those of 1965 (Table 10). Hence, strong resistance to these alternatives can be expected. On the basis of price alone, Plan F with acreage quotas is the most attractive of the six practical plans considered.

Some idea of the subsidy involved can be obtained by comparing the free market prices (Plans A,B,C) with the controlled market prices (Plans E,F,G) in Table 10. The difference in these prices constitutes a tax on the consumers of farm products. The main justification of such a tax is that it prevents hardships to the owners and renters of farm land. Yet, even the lower prices of free market plans A,B,C would be offset by increased yields and lower costs. The result, as the Heady-Mayer study shows, would be an increase in net income or economic rent as shown in Table 11. These increased returns would tend to be bid up into higher land prices. For example, under Plan B in the Northeast, the net increase in annual rent of $10.21, if capitalized at 5 percent, would result in an increase in land values of $204 ($10.21 ÷ .05 = $204). In the mountain region, $11.85 would capitalize at $237 an acre and in the Pacific, $34.02 at $684. The increase in land values under the feed grain or acreage quotas of Plans F and G would be much higher. However, some of the returns might also be retained by farmers as a higher income for their management. In either case this study indicates that a decision to adopt a free market system would not result in farm incomes lower than present incomes. It would result in higher incomes but not so high as those provided by acreage quotas of Plans F and G.

Consuming Regions and Location of Production

Where should wheat, feed grains, soybeans and cotton be produced in the United States? To help answer this question Heady and Mayer combined the 48 States into 31 consuming regions. Some small States in the East and South were combined as were Idaho and Montana, Nevada and Utah, and Arizona and New Mexico in the West. The demand for wheat, feed grains, soybeans and cotton was then determined for each of these regions. Next, the least cost per bushel or pound was calculated for each of the 31 consumption regions. This cost included both variable production transportation costs as well as the higher land rent that might result from increased demand for cropland limited by nature or artifically by acreage quotas.

The resulting costs per bushel for wheat and feed grains are presented in Table 12 as prices that would have to be paid to meet expected consumer demand under the seven farm plans. Wheat prices show that demand relative to supply is the greatest in the northeastern and Pacific regions where the population will continue to be large and the supply of land suited for low cost wheat production will continue to

Table 11.--Estimated increase in economic rent under seven farm programs by regions, United States, 1980

Farm programs	A	B	C	D	E	F	G
United States			Dollars per acre				
Northeast	6.29	10.21	10.13	63.05	12.04	28.33	19.93
Lake States	3.19	5.16	5.00	59.42	5.52	24.52	20.02
Corn Belt	3.77	8.01	7.69	83.43	9.76	33.83	28.08
Northern Plains	2.51	4.31	3.94	46.52	7.33	22.22	11.83
Appalachian	2.31	5.84	2.93	59.71	8.41	28.62	23.75
Southeast	.08	.18	.18	51.77	.28	17.43	13.97
Delta States	1.31	4.55	2.70	57.78	6.88	25.77	20.34
Southern Plains	22.08	27.07	17.06	49.65	28.75	42.11	35.98
Mountain	7.28	11.85	11.25	68.26	8.93	23.98	12.17
Pacific	24.61	34.02	29.58	68.25	30.85	57.63	38.61

Source: Heady and Mayer, Food Needs, Tables 8, 12, 16, 20, 24, 28, and 32.

Table 12.--Wheat and feed grain prices required to secure production on the highest cost land needed to meet expected consumer demand in each region, present plan, 1965, and seven projected plans, 1980

Wheat: dollars per bushel

Farm market plans	1965	A	B	C	D	E	F	G
United States	1.34	1.11	1.27	1.27	4.40	1.49	1.92	1.17
Northeast	1.35	1.35	1.46	1.45	4.44	1.71	2.13	1.47
Lake States	1.43	.97	1.05	1.04	3.89	1.38	1.81	1.16
Corn Belt	1.35	.97	1.08	1.08	4.18	1.35	1.77	1.06
Northern Plains	1.36	.67	.78	.76	3.93	1.06	1.49	.74
Appalachian	1.38	1.32	1.46	1.45	4.46	1.73	2.16	1.45
Southeast	1.42	1.40	1.48	1.48	4.35	1.83	2.26	1.61
Delta States	1.29	1.37	1.49	1.47	4.54	1.79	2.22	1.45
Southern Plains	1.34	1.20	1.38	1.34	4.55	1.66	2.08	1.30
Mountain	1.26	1.04	1.16	1.15	4.18	1.15	1.57	.91
Pacific	1.34	1.13	1.34	1.32	4.70	1.16	1.59	1.00

Feed grains: dollars per bushel

Farm market plans	1965	A	B	C	D	E	F	G
United States	1.10	0.69	0.76	0.75	2.49	0.78	1.48	1.41
Northeast	1.30	.86	.90	.90	2.63	.95	1.63	1.57
Lake States	1.01	.57	.61	.61	2.42	.63	1.39	1.33
Corn Belt	1.08	.47	.52	.52	2.23	.54	1.22	1.16
Northern Plains	1.13	.55	.60	.59	2.40	.62	1.29	1.15
Appalachian	1.24	.83	.89	.89	2.61	.94	1.60	1.55
Southeast	1.24	.91	.93	.93	2.70	.95	1.70	1.65
Delta States	1.27	.86	.94	.94	2.65	.95	1.66	1.60
Southern Plains	1.25	.61	.66	.86	2.59	.67	1.34	1.24
Mountain	1.23	.83	.93	.91	2.81	1.08	1.77	1.61
Pacific	1.44	1.06	1.16	1.14	2.90	1.17	1.86	1.72

Source: Heady and Mayer, Food Needs, Tables 8, 12, 16, 20, 24, 28, and 32.

be scarce. Under all seven plans wheat can be most cheaply produced or provided in the Northern Great Plains and feed grains in the Corn Belt. The comparative advantage of these regions is most apparent under free market conditions. (Plans A, B, and C). Under the feed grains and acreage quota programs these differences are reduced (Plans E, F, and G).

The differences in prices actually paid to farmers in 1965 are also quite small because a national support price is set for each product supported and then State support prices are set on the basis of transportation costs to the nearest major market. Because the large differences in costs of production are ignored, there are only small price differences among the regions.

Conclusions

Up to 1980, Heady and Mayer conclude that for all models studied "except the maximum production model which was aimed at determining potential levels of crop output, there remained excess land resources after the level of demand was satisfied. In the past several years, this excess productive capacity has been controlled by retiring a substantial acreage of cropland from production. However, under these circumstances, society not only loses production gain from these acres, but also bears the expense of holding the land in idleness."[8]

After exploring the use of idle cropland for pasture in case of greatly increased per capita beef consumption by 1980, the authors conclude there would probably still be idle cropland in most regions amounting to a national total of from 37 to 39 million acres.

Can this situation be expected to hold to the year 2000? The next section will assess America's century-end food and fiber needs.

Can U.S. Agriculture Meet Food and Fiber Needs of Year 2000?

In the United States, there are 2,271 million acres of land. When the 369 million acres in Alaska and Hawaii are omitted, there remain 1,902 million acres in the contiguous 48 States of which 407 million acres are federal lands and 1,496 million acres are non-federal (mostly private) lands.[9]

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[8] Ibid., p. 89.

[9] U.S. Department of the Interior, Public Land Statistics, (Bureau of Land Management, 1967), Table 7.

According to a National Inventory of Soil and Water Conservation Needs made by the Soil Conservation Service, in 1958 there were 638 million acres of land suited to regular or annual cultivation, but only 373 million acres were actually in cropland. The balance consisted of 113 million acres in pasture and range, 125 million acres of forest and woodland, and 26 million acres of other land (Table 13). If all these 638 million acres were brought into production, the present 300 million acres of harvested cropland would be increased by 112 percent. This would be ample to meet the estimated medium high population increase of 75 percent by 2000 even if yields on the new lands were considerably less than present national averages. In addition, there are another 169 million acres that could be used for intermittent or occasional crop production. Thus a total of 807 million acres is considered suitable for regular or intermittent cultivation.

In view of the abundant supply of non-federal cropland, should the arable federal lands be disposed of for crop production? Under a free market for cropland the development of new land would tend to hold down farm produce prices and land values. But developing new lands when production controls are in use is difficult to justify since the two policies are generally contradictory. Yet it can be argued that developing new cropland in the Pacific region might be justifiable to help lower food costs there and thus restrain land prices. Perhaps the same end could be achieved more effectively, however, by simply adjusting or removing production controls for that region. Generally the maximum benefit to the general public is achieved when food and fiber are produced at least cost to meet the demands of the various regions. They will tend to be produced at least cost if acreage, production quotas or other barriers do not interfere and if production in high-cost areas is not encouraged by no-cost land (homesteads) and heavily subsidized irrigation development. Some of the comparative costs of developing new lands for crop production will be reviewed later in this report, but first the amount of federal lands suited for crop production will be examined.

The evidence indicates that the present large supply of land suitable for production--when combined with increasing yields and new food sources--will be able to meet food and fiber needs for the future. This was also the conclusion of the National Advisory Commission on Food and Fiber when it declared "the United States has no shortage of the natural resources needed to produce food and fiber. This does not mean that some regional shortages may not occur, but with intelligent use and flexibility in regional production patterns, there is no forseeable shortage."[10]

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[10] Food & Fiber for the Future, National Advisory Commission on Food and Fiber, p. 243.

Table 13.--Non-federal, non-urban lands suitable for crop production in the 50 States, 1958

Present use	Lands suitable for crop production[a]		
	Regular use	Intermittent use	Total
	- - - - - - - - - 1,000 acres - - - - - - - - -		
Cropland	373,328	48,993	422,321
Pasture and range	113,393	53,938	167,330
Forest and woodland	124,909	58,413	183,322
Other uses	26,380	7,838	34,218
Total	638,009	169,181	807,190

Source: United States Department of Agriculture, National Inventory of Soil and Water Conservation Needs, Soil Conservation Service, 1958, as published in Food & Fiber for the Future, p. 245.

FEDERAL ARABLE LANDS: ARE THEY NEEDED FOR CROP PRODUCTION?

Amount of Arable Federal Lands

There are 371 million acres of federal public lands in the 17 Western States under administrative control of seven major federal agencies (Table 14). Much of this land is reserved for forests, and still more is used for grazing sheep and cattle. Some lands are parks and wildlife preserves, and others are utilized for defense activities. Much is mountainous and desert, presently unused by man to any extent.

This analysis is based only upon public lands that are arable--deemed suitable for intensive agriculture or crop production by federal agencies that now have administrative control. Estimates secured in a companion study (Volume IV)* indicate that only 2.0 million of the 371 million acres of federal lands are suited for dryland crop production and that water is presently physically and legally available for only an additional 1.3 million acres suited for irrigated crops (Table 15). There are another 35 million acres that could be irrigated if water were available, but the prospect of these lands being brought into production by the year 2000 are so remote that they are not included in this analysis.

Lack of water seriously limits the amount of irrigation possible in the West. As urban population and industry increase they will outbid agriculture for available water supplies. It has been estimated that water for irrigated crop production is worth only ten cents per 1,000 gallons while in industries requiring water for processing, its value may exceed $5.00 per 1,000 gallons.[11] In addition, irrigation is a consumptive use of water. Very little of it returns to streams where it can be re-used. In contrast, most urban and industrial use is not consumptive. The water is returned to streams where it is available for re-use or waste dilution.

The pressure on water supplies in western water resource regions is indicated by the fact that 20 percent of the maximum sustainable flow is consumed as compared with only 1 percent in the eastern regions. Not only is there about one-third as much water in the West as in the East, but much more of it is used for crops. Of 64 million acre-feet consumed in the West, 60 million, or nearly 94 percent, were used up by irrigation.

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[11] C. P. Barnes, "Land Resource Potentials of the United States and World Regions," in Modern Land Policy, Land Economics Institute, University of Illinois (Urbana: University of Illinois Press, 1960), p. 80.

*This reference is to Volume IV Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

Table 14.--Federal public lands estimated suitable for dryland or irrigated crop production in 17 Western States, 1968, by agency

Agency	Federal lands held--total[a]	Federal lands--arable[b]		
		Dryland	Irrig.[c]	Irrig.[d]
	- - - - - - - - - - -	1,000 acres	- - - - - - -	
Bureau of Land Management	174,949	569	516	28,450
Forest Service	143,789	842	101	933
Bureau of Reclamation	9,012	23	424	371
National Park Service	12,854	21	5	696
Bureau of Sports, Fisheries and Wildlife	6,463	83	114	58
Department of Defense	17,351	344	151	4,550
Corps of Engineers	3,671	113	1	11
Agency not determined	3,211	0	0	0
Total acres	371,300	1,996	1,313	35,086
National Grasslands[e]	6,179	510	115	538

[a] Public Land Statistics 1967, Tables 7 and 9.

[b] As reported by agencies. See Vol. IV* of this report.

[c] Deemed irrigable with water physically and legally available.

[d] Deemed irrigable but water not now physically or legally available.

[e] National Grasslands/Land Utilization (LU) lands are administered by the Bureau of Land Management and the Forest Service. These acres are included in their figures.

*This reference is to Volume IV, Working Paper on Federal Public Lands suited for Intensive Agriculture in Western United States.

Table 15.--Estimated acres of land suitable for farming as reported by seven federal agencies in 17 Western States, 1968

State	Federal land owned[a]	Federal land reported[b]	Dryland	Irrigable (water available)	Irrigable (water not available)
	- - Millions of acres - -		- - - - - - Thousands of acres - - - - - -		
Arizona	32.4	33.0	0	11	7,145
California	44.4	44.7	172	137	6,129
Colorado	24.0	23.0	103	88	298
Idaho	34.0	31.6	85	314	2,623
Kansas	.6	.6	99	43	0
Montana	27.6	26.9	279	6	13
Nebraska	.7	.6	10	5	26
Nevada	61.0	60.6	4	7	9,916
New Mexico	26.7	26.1	0	11	2,922
North Dakota	2.1	2.2	262	4	4
Oklahoma	1.4	1.2	44	3	45
Oregon	32.2	29.6	67	72	625
South Dakota	3.4	3.3	237	46	97
Texas	3.0	2.3	149	6	190
Utah	35.2	35.2	1	14	2,557
Washington	12.6	13.8	15	158	42
Wyoming	30.0	30.7	469	387	2,437
Totals	371.3	365.4	1,996	1,313	35,068

[a] From Public Land Statistics 1967, Table 7.

[b] Reported by seven federal agencies surveyed in 1968. See Vol. IV, Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

While it may be physically possible to bring water to the West from the Columbia River or even the Yukon, the costs are prohibitive for agriculture and are likely to remain so for the forseeable future. When crops produced per 1,000 gallons are worth only a few cents, the water charge must be extremely low to make irrigated crop production profitable. Desalination of sea water may eventually ease the pressures on river and ground water in urban communities, but at present there seems little or no prospect that sea water can be utilized for irrigation.

Available Arable Federal Lands

It is assumed that arable lands held by the Forest Service, Department of Defense, National Parks, and Bureau of Sport Fisheries and Wildlife have high economic, political or social uses and will not be available for intensive agriculture. Therefore this study has been limited to lands controlled by the Bureaus of Land Management and Reclamation and the U.S. Army Corps of Engineers. These seem to be the federal lands most likely to be brought into crop production in the next 30 years. They total only 705,000 acres for dryland crop production and 941,000 irrigable acres for which water is presently available (Table 16). Most of the dryland acres are in Wyoming, Montana, North Dakota, and South Dakota. None of the other 13 States has over 200,000 acres and nine States have fewer than 100,000 acres. The average for each of the 17 States is only slightly more than 100,000 acres. Irrigable land with water available amounts to 387,000 acres in Wyoming and 314,000 acres in Idaho. Washington has the next largest amount with 158,000 acres, and California has 137,000 acres. None of the other States has as much as 100,000 acres, and 10 States have less than 50,000 acres each.

These lands, if used for crop production, would increase dryland harvested cropland in the 17 Western States by less than 1 percent and irrigated harvested cropland by only 3 percent (Table 17). In only five States would the dryland be increased by more than 1 percent, and in only six States would irrigated land be increased by more than 1 percent. Wyoming would have by far the largest increase, 34 percent in dryland and 35 percent in irrigated acreage. Idaho would have a 5 percent increase in dryland with a 14 percent increase in irrigated land, and Washington and Colorado would have 11 and 3 percent increases in irrigated land, respectively.

The number of new farms that might be created from these federal lands is quite small. If $5,000 were considered an adequate annual return to the farmer for his labor and management, then 1,200 acres of dryland crops or 300 acres of irrigated crops would be needed in

Table 16.--Federal public lands suited for crop production held by three federal agencies in 17 Western States, 1968

State	Bureau of Reclamation		Bureau of Land Mg't		Corps of Engrs.		Total	
	Dryland	Irrigated	Dryland	Irrigated	Dryland	Irrigated	Dryland	Irrigated
	1,000 acres							
Arizona	0	6	0	0	0	0	0	6
California	4	20	0	0	0	0	4	20
Colorado	2	13	101	72	0	0	103	86
Idaho	0	146	83	160	0	0	83	306
Kansas	2	0	0	0	24	0	26	0
Montana	12	5	88	0	5	0	105	5
Nebraska	1	1	0	0	0	0	1	1
Nevada	0	2	0	0	0	0	0	2
New Mexico	0	0	0	0	0	0	0	0
North Dakota	0	0	4	0	18	0	22	0
Oklahoma	0	0	1	0	1	0	3	0
Oregon	1	23	59	0	0	0	60	23
South Dakota	0	0	30	0	1	0	31	0
Texas	0	0	0	0	61	0	61	0
Utah	0	1	0	0	0	0	0	1
Washington	1	103	0	0	2	1	3	104
Wyoming	0	102	203	284	0	0	203	387
Totals	23	422	569	516	112	1	705[a]	941[a]

Source: Estimates provided by these three agencies, 1968. See Vol. IV, Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

[a] The 705,000 dryland and 941,000 irrigable total 1.6 million acres. If Forest Service L.U. lands are added, the total would be 2.2 million acres. See Table 3 (p. 175).

Table 17.--Private cropland harvested and arable federal lands held by Bureau of Land Management, Bureau of Reclamation and Corps of Engineers in 17 Western States

State	Private cropland harvested[a]			Federal arable public lands[b]			
	Total	Dryland	Irrigated	Dryland	Irrigated[c]	Dryland Increase	Irrigated Increase
	1,000 acres					Percent	
Arizona	1,025	20	1,005	0.0	6.0	0	*
California	7,846	1,409	6,437	4.1	20.3	*	*
Colorado	4,726	2,682	2,044	103.4	85.9	4	3
Idaho	3,935	1,696	2,239	83.0	306.3	5	14
Kansas	18,160	17,312	848	26.2	0.0	*	0
Montana	7,813	6,433	1,380	104.9	5.2	2	*
Nebraska	15,229	13,167	2,062	0.7	1.0	*	*
Nevada	507	4	503	0.0	2.5	0	1
New Mexico	906	218	688	0.0	0.0	0	0
North Dakota	17,695	17,646	49	22.3	0.0	*	0
Oklahoma	8,344	8,084	260	2.5	0.0	*	0
Oregon	3,050	1,964	1,086	59.6	22.5	3	2
South Dakota	14,445	13,310	1,135	31.0	0.0	*	0
Texas	19,408	13,509	5,899	61.0	0.0	*	0
Utah	1,039	270	769	0.0	1.1	0	*
Washington	4,423	3,514	909	3.3	103.8	*	11
Wyoming	1,702	598	1,104	203.1	386.6	34	35
Totals	130,253	101,836	28,407	705.1[d]	941.2[d]	1	3

[a] 1964 U.S. Census of Agriculture, Vol. 2, Chap. 3, pp. 248-49.

[b] From Table 18 of Volume IV, Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

[c] Water available.

[d] The 705,000 dryland and 941,000 irrigable total 1.6 million acres. If Forest Service L.U. lands are added, the total would be 2.2 million acres. See Table 3 (p. 175).

*Less than 0.5 percent.

most areas of the West. Thus the 705,000 acres deemed suitable for dryland farming would create fewer than 600 new dryland farms, and the 941,000 acres suited for irrigation would create perhaps another 3,100 irrigated farms in the 17 Western States.

Even these estimates may be high. Much of this land is in small tracts scattered along streams that are often in mountainous areas difficult to reach and far from public services considered essential for modern living. It seems probable that they would eventually be used by ranchers for hay and winter feeds or to enlarge other farms that are too small to provide a satisfactory living.

Probable Contribution of Federal Public Lands to Food and Fiber Needs

The contribution of arable federal lands to future food and fiber needs depends not only upon their acreage but also upon potential crops and their yields. This analysis assumes that dryland crops grown and the acres of each crop will be approximately the same as planted acres of the major crops in the 11 Western States. These States were used because the eastern portions of the Great Plains are not typical of the areas where most of the federal arable lands are located. It is also assumed that irrigated crops grown and the acres of these crops would closely approximate the pattern of irrigated crops in the 17 Western States as shown in Figure 9. Most of this irrigated cropland is in areas like those of the arable federal lands suited for irrigation. Finally, it is assumed that the yields of these crops will approximate average yields in the nation.

With these assumptions Table 18 was prepared. It indicates that arable federal lands would increase the nation's 300 million acres of harvested cropland only slightly more than 0.5 percent (rounded to 1 percent). The increases by crops are also shown. Only barley and sugar beets would increase by more than 1 percent under these assumptions. Since any rise in yields by 1980 or 2000 would probably affect the new lands as much as the old, the percentage contribution of new lands to food and fiber needs would not change.

The probable effect of arable federal lands on crops produced in each of the 11 Western States with such lands is shown in Tables 1-11, Volume IV, Working Paper on Federal Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980 and 2000, Appendix A. These tables are included to illustrate the small acreage changes that would occur if these lands were developed. They are not predictions of crops that might be grown.

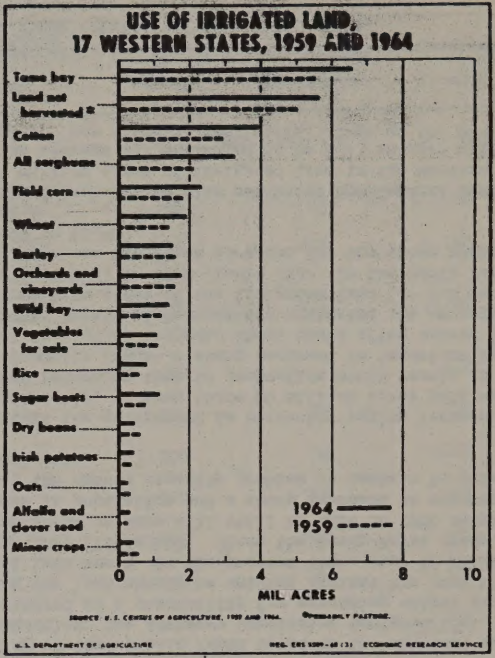

Figure 9

Table 18.--Estimated effect of federal public lands suitable for crop production on total acres of cropland, by crop

Crops	Harvested cropland[a]	Estimated use of arable public lands			
		Dryland	Irrigated	Total	Increase
	- - - - - - - - - -	1,000 acres	- - - - - -		percent
Total	300,446	705	941	1,646	1
Corn, grain	60,557	14	65	79	*
Wheat, all	58,771	197	56	253	*
Oats	16,017	21	19	40	*
Soybeans (beans)	39,767	0	0	0	0
Barley	9,177	99	47	146	2
Minor grains	5,000	0	19	19	1
Sorghums	16,000	127	94	221	1
Cotton	13,400	0	112	112	1
Hay, all	66,800	225	404	629	1
Beans, dry	1,428	0	19	19	*
Potatoes	1,358	0	19	19	1
Sugar beets	1,228	0	38	38	3
Vegetables, fresh	1,638	0	18	18	1
Vegetables, other	1,675	0	20	20	1
All other	12,630	1	11	12	*

[a] 1967 data for the 48 contiguous States from *Crop Production, 1968 Annual Summary by States*, U.S. Department of Agriculture (Statistical Reporting Service, 19 December 1968), p. 3.

[b] Does not include L.U. lands supervised by the Forest Service

[c] Total arable federal lands divided by harvested cropland, 48 States.

* Less than 0.5 percent.

SOME COSTS OF DEVELOPING LANDS FOR DRY AND IRRIGATED CROP PRODUCTION

The National Advisory Commission on Food and Fiber has declared that "reclamation and land development projects paid for by public investment have significantly increased farm production in the past three decades, during which agriculture was plagued with overproduction and surpluses. Clearly it is unsound policy to invest public funds in new farm capacity at a time when the overriding problem is too much capacity." Therefore "*the Commission recommends that public funds for agricultural reclamation, irrigation, drainage and development projects should be justified on the basis of whether they represent the cheapest means of getting additional farm production--if needed.*"[12]

In deciding whether public funds would be the cheapest way to get additional production, the Advisory Commission declared that "all land should be considered as a possibility for expanding output and the cost of transforming the land should be weighed against the cost of putting idle acres back into use." At the present time, over 60 million acres of cropland are idle (Table 19). Since the Heady-Mayer study indicates that 35 million acres or more will still be idle in 1980 despite a 26 percent increase in population and a sharp increase in consumption rates, it appears that the excess capacity problem is certain to persist well beyond that date.

The fact that the government is currently paying farmers, either directly or indirectly, to keep these 60 million acres idle makes it quite clear that returning them to production would result in substantial savings of public funds--a sharp contrast to transforming land through federal irrigation projects whose costs often exceed $1,000 an acre. In 1959 the Bureau of Reclamation estimated the average cost of developing 9.5 million acres of new irrigated land (or its equivalent in old cropland) at $921 an acre (Table 20). In the south Pacific region the estimate was $2,780 an acre, and for the other regions it ranged from $600 to $1,400.

The Bureau of Reclamation also estimated non-federal costs of developing 2.7 million acres of irrigated land in the Western States (Table 20). The average was estimated to be $313 an acre with a range from $140 to $659. For example, the initial stage of the Oahe Unit of the

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[12] *Food & Fiber for the Future*, National Advisory Commission on Food and Fiber (italics in original), p. 21.

Table 19.--Land diverted from crop production by government production or conservation programs, 1956-1966

Year	Acreage Reserve	Conservation Reserve	Feed Grain	Wheat	Cotton	Crop-land Conversion	Crop-land Adjustments	Total†
			(million acres)					
1956	12.2	1.4	...	...	..	..	..	13.6
1957	21.4	6.4	...	...	..	..	..	27.8
1958	17.2	9.9	...	...	..	..	..	27.1
1959	...	22.5	...	...	..	..	..	22.5
1960	...	28.7	...	...	..	..	..	28.7
1961	...	28.5	25.2	...	..	..	..	53.7
1962	...	25.8	28.2	10.7	..	..	..	64.7
1963	...	24.3	24.5	7.2	..	0.1	..	56.1
1964	...	17.4	32.4	5.1	0.5‡	0.1	..	55.5
1965	...	14.0	34.8	7.2	1.0‡	0.4	..	57.4
1966§	...	13.3	32.0	8.2	4.7	0.4	2.0	60.6

* Source: USDA.
† Total diverted including acreage devoted to substitute crops.
‡ Not required to be put to conserving uses.
§ Except for conservation reserve, represents enrolled acreage Agr. Stab. and Conserv. Ser., USDA, *Agricultural Statistics 1966*, GPO, p. 541.

Source: Food Goals, Future Structural Changes, and Agricultural Policy: A National Basebook (Ames: Iowa State University Press, 1969), p. 307.

Table 20.--Irrigation development costs per equivalent acre as estimated by Bureau of Reclamation, 1959

Water resource region	New land equivalent[a] Federal	New land equivalent[a] Non-federal	Cost equivalent new land Federal	Cost equivalent new land Non-federal
	- - - 1,000 acres - - -		- - Dollars per acre - -	
Upper Rio Grande and Pecos	165	- - -	$ 750	$ - - -
Upper Missouri	2,740	603	1,160	200
Upper Arkansas and Red	174	731	1,167	207
Lower Arkansas Red-White	52	- - -	566	- - -
Western Gulf	796	88	730	659
Colorado	1,200	69	1,374	140
Great Basin	260	299	906	251
Pacific Northwest	2,650	802	646	484
Central Pacific	1,445	84	681	384
South Pacific	18	24	2,780	425
TOTALS	9,500	2,700	$ 921	$ 313

Source: U.S., Congress, Senate, Select Committee on National Water Resources, Future Needs for Reclamation in the Western States: Water Resources Activities in the United States, 86th Congress, 2nd Session, 1960, Committee Print 14, Table 11, p. 19.

[a] Includes not only new, previously uncultivated irrigated lands but also allows for any previously cultivated lands scheduled to receive some water.

Missouri Basin Project, recently authorized, calls for the irrigation of 190,000 acres of land with total allocated costs of $25.8 million or $1,083 an acre. By charging some of these costs to main-stem storage and power the cost is reduced to $881 an acre. Of this amount the landowner is expected to pay only 15 percent and Missouri River Basin power revenues, 84 percent. Thus this project involves a subsidy of $740 to $910 an acre, the amount depending on cost allocation.[13]

While the necessity of subsidizing 84 percent of the cost of irrigation development clearly indicates that from the national viewpoint such development is not economic, the Bureau of Reclamation was still able to show direct benefits of $1.60 for each $1.00 spent. The Bureau explains as follows: "Direct irrigation benefits result from the increase in net farm income with the application of water. These benefits include increases in family living and in accumulation of equity in the farm investment."[14] Quite obviously such benefits involve double counting of net income--once when it is received and again when it is spent to improve family living or pay off debts. These and other weaknesses of the benefit-cost analyses of the Bureau of Reclamation have been pointed out by several economists including Douglas and Renshaw.[15] (Renshaw's article cited below is reproduced in Volume IV, Working Paper on Federal Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980 and 2000, Appendix B).

There are other lands which might be developed or used for crop production including 113 million acres of pasture and range, 125 million acres of forest and woodland, and 26 million acres of other land (Table 13). Moreover, there are another 169 million acres that can be used from time to time, and much of this acreage is in more humid areas of the United States where irrigation is not necessary. Some of these lands would need clearing or drainage.

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[13] U. S., Congress, House, Oahe Unit, *Missouri River Basin Project, South Dakota: Report on the Initial Stage of the Oahe Unit . . .*, 90th Congress, 1st Session, 1967, House Document 163, Table 2, pp. 46-50.

[14] *Ibid.*, p. 41.

[15] Edward F. Renshaw, "Appraisal of Federal Investment in Water Resources" in *Modern Land Policy*, Papers of the Land Economics Institute, University of Illinois (Urbana: University of Illinois Press, 1960), Paper 17; and Paul H. Douglas, *Why the Upper Colorado River Project is Against the Public Interest*, Remarks in U.S. Senate, 18 April 1955 (Washington, D.C.: U.S. Government Printing Office, 1955).

How does the cost of clearing and draining land compare with the Bureau of Reclamation's 1959 estimates of irrigation costs? A general survey of land clearing and draining costs was made by Wooten and Purcell in 1949.[16] They found that there were many millions of acres of land that could be developed for farming by clearing and draining and cited the following costs per acre:

Kind of work	Cost in dollars per acre
1. South	
Draining undeveloped land in drainage districts	$ 5 - $ 30
Clearing costs (stumps remain)	$25
Clearing costs (stumps removed)	$50 - $ 75
2. Northeast	
Brush cleared for seeded pasture	$50 - $110
Brush cleared for cultivated crops	$95 - $160
Light brush cleared from abandoned fields	$15 - $ 30
Clearing of brush and stone	$50 - $100
Clearing for drainage	$30 - $125
3. Southeast	
Custom clearing, group basis	$36 - $ 50
Clearing small trees and brush	$25
Clearing, stumping and draining	$60 - $ 75
Clearing or drainage	$40 - $ 55

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[16] H. H. Wooten and Margaret R. Purcell, *Farm Land Development: Present and Future by Clearing, Drainage and Irrigation*, U.S. Department of Agriculture Circular 825 (1949).

	Cost in dollars per acre
4. **Mississippi River Delta**	
Clearing land	$30 - $100
Buying and clearing land	$65
Cost of land and clearing	$60 - $100
5. **Northwest**	
Easy clearing	$18 - $ 39
Medium clearing	$57
Difficult clearing	$80
Clearing heavy timber and stumps	up to $200

No doubt some of these lands have been brought into production during the past 20 years. It also seems likely that those most cheaply cleared or drained may have been the first developed. Hence, future costs will be higher not only because of inflation but also because lands remaining will be more difficult and more expensive to clear and drain. Even so, the figures suggest that millions of acres of uncleared and undrained lands could be brought under cultivation for well under $200 an acre.

Whether or not it is economical to clear and drain these lands is certainly another question. The fact that over 60 million acres of croplands have been retired from production under various governmental programs indicates that such development even at these low costs would not result in "maximum benefit for the general public" at this time. However, by the year 2000 these lands may be needed. If so, demands for food should tend to result in higher farm prices and provide incentive for developing them.

VI. SUMMARY AND CONCLUSIONS

Can U.S. agriculture meet the food and fiber needs of 1980 and 2000? What contribution can arable federal lands make that is consistent with "maximum benefit to the general public"? The purpose of this paper was to help answer these questions by a review and analysis of the situation which appears to be as follows:

1. While world population is expected to double by the year 2000 and thus create unprecedented demands for food, demands in the underdeveloped countries must be met, except in time of drought or diaster, mostly by local production.
2. The U.S. contribution to food and fiber needs of other countries will be maximized by providing fertilizers, insecticides and other chemicals, seeds, tools and technical help rather than food.
3. The demand for U.S. agricultural production will continue to be largely limited to the needs of the domestic population and the developed countries that find it profitable to import our foods, feeds, and fibers.
4. The U.S. population is expected to increase about 25 percent by 1980 and 75 percent by 2000.
5. A study made for the National Advisory Commission on Food and Fiber by Professors Earl Heady and Leo Mayer of Iowa State University indicates that, despite expected rises in population and foreign demand, the increase in yields and efficiency will be so great that no more than 20 million of the 60 million acres of idle cropland will be called back into production by 1980.
6. A survey by the Soil Conservation Service indicates that out of the 638 million acres of land suited for regular crop production in the United States in 1958, 373 million acres were in cropland. Currently only 300 million acres of cropland are being harvested, and 60 million acres have been retired from production by government programs.
7. Even if there were little or no increase in yields and technology, U.S. food and fiber needs of the year 2000 could be easily met by increasing crop acreage from 300 million to 600 million.
8. Of the 371 million acres of federal public lands, only 3.3 million acres are deemed arable or suitable for crop production by the seven federal agencies that now administer these lands; only 705,000 acres suited for dryland crop production and 941,000 acres suited for irrigation are likely to be available. These are lands held by the Bureau of Land Management, Bureau of Reclamation, the Corps of Engineers. The contribution of these 1.6 million acres of federal lands to food and fiber production needs would be very small indeed.

9. The Bureau of Reclamation estimated the cost of future federal irrigation projects at $921 an acre and non-federal projects at $313 an acre. Both these costs far exceed clearing and draining costs for millions of acres of land in humid areas of the United States. The latter would seldom exceed $200 an acre.

10. The evidence indicates that U.S. agriculture can easily meet food and fiber needs for both 1980 and 2000 without the use of the 1.6 million acres of federal lands considered suitable and available for crop production.

11. As was stated earlier, this particular analysis assumes that the maximum public benefit will be achieved if food and fiber needs are met at least cost. This viewpoint is national in scope and strictly economic. It is recognized that important State and local economic viewpoints and national and local non-economic considerations exist also. Such factors are discussed in other parts of this report.

C. PROBABLE EFFECTS OF NEW CROPLAND ON LOCAL AND REGIONAL ECONOMIES IN THE WESTERN UNITED STATES

INTRODUCTION

Would development of federal public lands suitable for intensive agriculture benefit the regional State and local economies of the Western States? This is a valid consideration, distinct from national considerations such as the total quantities of suitable lands and future needs for agricultural products. Since the Public Land Law Review Commission is expected to make a recommendation regarding this question, this study was made to provide the Commission with indications of the possible benefits of such land development to three local economies of the West. Specifically, the contract (Appendix A, 4g) calls for the joint selection of three areas and specifies that "the economy of the county or counties selected for study will be essentially oriented to agriculture, but with an urban trade center large enough to allow the contractor to identify and analyze the multiplier effect of changes in the agricultural sector upon the other sectors of the local economy. The analysis is to be based on information available from various government and other reports and shall provide answers to the following questions:

(1) What changes have taken place in the economy of the study area between 1950 and the present in terms of such measures as population, employment, per capita, and per family income, and local property tax collections?

(2) What changes have taken place in the agriculture sector of the study area, including changes in number of farms, average size of farms, farm and per farm income, farm employment, and cropping patterns?

(3) To what extent can the economic development of the study area and changes in area and individual wealth positions be attributed to the development of agriculture on new lands? Segregate effects on population, employment and income for agriculture, agriculture-related industry, and other export base industry or activity. Identify major developments that have taken place in the nonagriculture sector that have influenced development of the regional economy.

(4) On the basis of available information, identify and quantify, to the extent possible, changes in the economy of the study area that could take place during the next decade as a result of the development of additional new agricultural lands."

The three areas selected for intensive study were Yavapai County, Arizona; Cassia County, Idaho; and Phillips County, Montana. These counties were chosen because:

(1) they have public land areas large enough so that a change in use could have an important effect on the local economy,

(2) they are typical of many counties in the West,

(3) they are relatively free from other factors which might influence economic activity in the community,

(4) they have arable lands that can be bought into production without excessive costs, and

(5) they had a relatively large increase in agriculture between 1949 and 1964.

Subsequently it was decided to show, insofar as data permitted, the probable effects of development of the new lands on the West as a region and on 11 Western States as well as on the three local economies.[1] Briefly, this report will attempt to answer these questions:

What is the relative role of agriculture in the West?

What would be the likely contribution of arable federal lands to regional and State economies?

What changes have occurred in the rural economies of the three selected counties?

What are some of the changes in urban and public areas of the three selected counties?

What effect would the development of arable federal lands have on the selected counties?

THE ROLE OF AGRICULTURE IN THE WESTERN ECONOMY

Typically, many people think of the Western United States, except for the Pacific coast, as being vast treeless prairies, tumbled mountain ranges, and primeval forests. Such a view is correct even today, but it fails to recognize the changing demographic, economic, and geographic faces of the West. Other people think of the Western States as being dominated by agriculture, particularly cattle ranching. Such a view was, of course, essentially correct for the West of yesteryear. However, the agricultural industry of the region today can be characterized as being both broadly diversified and highly specialized, for example, the citrus fruit and garden crop area in southern California, the apple growing sections of Oregon and Washington, the potato area in southern Idaho, wheat areas in Montana, and garden crop production on irrigated land in Arizona. There remain, of course, considerable generalized farming and specialized range cattle production in extensive areas of the West not suited to specialty crop production.

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[1] The total acreage of arable federal lands in these 11 Western States is 1.5 million--the other 100,000 acres of the 1.6 million in the 17 Western States are in the six States not included in this part of the study.

Total agricultural production has increased in both physical and monetary terms since the West was settled, and it undoubtedly is still increasing. Products of western agricultural industry help to feed the rapidly growing population of both the Western States and the nation as a whole. Nevertheless, agricultural production is not dominant even though such production, along with mining and forestry, is still basic to the economy of both the region and the nation.

Direct agricultural production of crops and livestock represents less than 10 percent of the total economic production of the 11 Western States and combined with agricultural product processing it represents one-sixth of the total economic activity (Table 2). The growth of non-agricultural industry and other economic activities has relegated total agricultural production and processing to a relatively minor role which is likely to decline in the future. Although empirical evidence is not presented here, history indicates that as a geographic area develops, it tends to become relatively less agrarian and more urban. Even though agricultural production may increase somewhat, its relative role in terms of total economic activity declines.

The role of agriculture in the economy of each of the 11 Western States varies considerably (Table 2). First, the combined agricultural production and processing enterprise represents one-third or less of total economic activity in any of the several States, including those usually thought of as predominately agrarian. Second, livestock production exceeds other agricultural production in importance in only two States, New Mexico and Utah. Third, other agricultural production equals or exceeds livestock production in importance in Arizona, Montana and Wyoming, all usually considered as specialized range cattle production States. Fourth, agricultural processing is more important than direct agricultural production in California, Oregon, Utah and Washington--indicating products requiring extensive processing, handling, and packaging before they reach the consumer. Fifth, and very surprising, the combined agricultural production and processing enterprise represents 12 percent or less of total economic activity in Nevada, New Mexico, Utah, Washington, and Wyoming--States usually considered primarily agrarian.

Some counties in the West are practically devoid of any hamlet, village, or town, and economic activity is nearly all agricultural. A few counties are entirely urban or nearly so; accordingly, the relative role of direct agricultural production in the economy approaches zero, but the role of the agricultural product processing industry may still be significant. Most counties fall between these two groups. In many, agricultural production and product processing are the predominant economic activities; in other counties agriculture represents less than 25 percent of the total productive activity.

The effects of bringing new agricultural land into production would be significantly different among the counties depending upon the dominance of agriculture in the economy. If a given county is predominantly agrarian, the primary effect would be on agricultural industry with the secondary effect (business generating effect) primarily benefiting larger geographic economies. The larger the economic area the larger the secondary or business generating effect. Accordingly, the secondary or business generating effect of new agricultural land would tend to be greater for a given State than for any county within the State and greater for the western region as a whole than for any State within the region.

POSSIBLE CONTRIBUTIONS OF NEW FEDERAL LANDS TO THE WEST AND TO STATE ECONOMIES

What would be the probable effect of the development of 1.5 million acres of arable federal lands on the West as a region and on individual Western States? (Table 1) This depends on (1) the acreage of dry and irrigated land, (2) the crops likely to be grown, (3) the yields of these crops, (4) the price or value of the crops, and (5) the indirect effects of this production on the economy. Once these direct and indirect effects have been calculated, they can be compared with current production in the region and in each of the States.[2]

In the 11 States 58 percent of the harvested cropland is irrigated land, while 63 percent of available federal lands suited for crop production are deemed irrigable. Since State by State comparisons in Table 3 reveal that the proportion of these new public lands compares favorably with the present situation, it is assumed that crops and yields on the new lands would be the same as those presently achieved. The new federal lands were, therefore, divided among the various crops on the same basis as planted acres, and the results are shown in Table 4. Hay, fruits and vegetables were all omitted in this analysis.

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[2] This analysis includes lands controlled by the Bureaus of Land Management and Reclamation, and the Corps of Engineers. L.U. lands supervised by the Forest Service are not included. The latter total 54,006 acres in the 11 Western States and include 50,000 acres dryland and 4,006 acres of irrigable land with water available. Omission of these lands does not significantly affect the conclusions of this study.

Crop yields used for new federal lands were 19-year averages for each of the States (Table 5). Estimated total crop production by States and crops is shown in Table 6. Total values of these crops for each State were calculated at 1968 prices and are presented in Table 7.

These total values are the direct effects of developing new federal lands. But economic development is a complex matter since direct effects have indirect effects on all other sectors of the economy. Indirect effects can be determined by a complex, mathematical method called input-output analysis. The result is an output multiplier for each sector of the economy studied. This multiplier indicates how much indirect effect should be added to the direct effect to get the total output effect on the economy.

Output multipliers for various sectors of the economies of 11 Western States are in Table 8. Note that these studies by different research workers have divided the agricultural production of each State into sectors with range livestock, crops, and agricultural processing being the most popular.

While output multipliers have not been developed for the West as a region, the simple averages at the bottom of Table 8 may give some indications as to what might be expected. For every $100 of new crops produced, $136 would be the total output effect on the economy--assuming that 1.36 is the correct output multiplier.

The effect of crop multipliers on the estimated production of the federal lands is shown in Table 9. Because Idaho, Montana, Oregon and Utah do not have a "crops" multiplier, their "other agriculture" multiplier was used (excluding range livestock). In States with little new land both direct output and total output effects are small. New Mexico with no arable federal lands is the extreme example and is followed by Utah and Nevada. The total output effect for the 11 Western States is $114.3 million or $1.3 million less than if the average crops multiplier of $1.36 had been used. Even this multiplier is probably low since in a region as large as the West, there would be more opportunities for inter-industry trade than within any State.

How much would the direct effects of new federal lands increase the value of crops produced in the 11 Western States? Percentage increases are shown in Table 10. For the West as a region, the increase is only 2.0 percent. Wyoming shows a surprising 32 percent increase. However, this percentage is misleading since Wyoming has only 1.7 million acres of cropland but 0.6 million acres of arable federal lands that could be developed.

When the total value of crops that might be produced on arable federal lands is compared with total output of the economy of each State, any increase is insignificant. For example, the Western States as a region had a total economic output of 67.3 billion dollars (Table 11), and the 114.3 million dollars from arable federal lands would be less than 0.2 percent of that amount. It should be emphasized, however, that crop production on these lands might be of considerable value to the local communities.

The question remains as to whether these lands should be developed in view of the present 61 million acres of idle cropland along with no need of additional land for producing food and fiber in the foreseeable future. If strengthening the economies of the West is desirable, then alternative possibilities should be explored. This is particularly true where the development of arable federal lands for irrigation may require subsidies that exceed $1,000 an acre (see Volume IV, Working Paper on Federal Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980 and 2000).

SOME CHANGES IN THE RURAL SECTORS OF THREE SELECTED COUNTIES IN ARIZONA, IDAHO AND MONTANA

As noted previously, the three counties selected for intensive study were Yavapai County, Arizona; Cassia County, Idaho; and Phillips County, Montana.

Yavapai County, in west central Arizona, is just west of Flagstaff and north-northwest of Phoenix. Prescott, near the center of the county, is the largest city.

Cassia County, Idaho, is in the southernmost tier of counties east of Twin Falls. The Snake River forms its northern boundary. Burley is its largest and only city.

Phillips County, Montana, lies between the Canadian border on the north and Fort Peck Reservoir on the south. U.S. Route 2 crosses the middle of the county; Malta is the largest town and the county seat.

The sizes of these three counties with the percentages devoted to farms and ranches in each are shown in Table 12. It should be recalled that the U.S. Bureau of the Census does not distinguish between farms and ranches, and therefore much of the land in farms may be grazing land. However, federal, State, and county lands used under permit are not included in farms.

There has been considerable increase in lands in farms in all three counties since 1949, but in Yavapai County very little of this additional land has been used for crops (Table 12). While Yavapai had a 2,000-acre increase in cropland, it had a 4,000-acre decrease (33 percent) in harvested acres during this period. Both Cassia and Phillips had large increases in total cropland and cropland harvested. Irrigated cropland increased only 1,000 acres in Yavapai, 14,000 in Phillips, and 90,000 acres in Cassia (Table 13).

What effect have these changes in cropland acres had on the economies of these three counties? That there were some positive effects cannot be doubted, but specific effects are very difficult to identify. Many other factors besides increases in cropland affect such economies. One of these factors is the decline in the number of farm families (Table 13). There was a sharp decrease in the total number of farm workers between 1940 and 1960, and further sharp decreases are projected for 1970.

One of the reasons for decreasing farm employment is the rapid decline in the number of farms (Table 14). This decline has resulted from new technology which makes it possible and necessary for farm families to operate larger acreages. The decline in farm numbers and the increase in farm sizes are expected to continue with smaller farms being absorbed by larger, more efficient units.

Realized net incomes per farmer are shown in Table 15. In Arizona and Idaho these figures indicate substantial increases, but in Montana incomes in 1964 were somewhat less than in 1949. This difference may have been due to cattle prices, but the cause was not determined. Phillips County (Montana), however, showed some increase in net income per farm but not nearly so much as Cassia County. Despite the large increase in the average farm net income in Arizona as a whole, Yavapai County had a decrease in farm income.

The value of farm real estate increased remarkably in all three States between 1949 and 1964. In Arizona the value per acre went up 340 percent while in Idaho and Montana it increased 200 percent. Part of the rise is undoubtedly due to greater efficiency and productivity of the land, and part is due to inflation and speculation. However, the demand for land to enlarge farms seems to be a basic factor in the rapid increase in land prices all over the nation.

CHANGES IN THE URBAN SECTORS OF THREE SELECTED COUNTIES

Since the three counties, Yavapai in Arizona, Cassia in Idaho, and Phillips in Montana were selected by the same criteria, it is not surprising that they have certain characteristics in common.

In all three counties rural population decreased (Table 16). The decline, part of a national trend caused by the mechanization of agriculture, brought about a similar decline in rural trade areas, but urban populations increased--from 1 percent in Phillips County to 114 percent in Yavapai County. In the latter an influx of light industry in Prescott and vicinity caused the marked rise. This influx was possible primarily because of the proximity of Prescott to other larger population and manufacturing centers. In Cassia County, increases in the population and labor force were a response to the growing number of agricultural processing plants made possible because of increased irrigated crop production.

Total population in Yavapai and Cassia Counties increased by approximately 10 percent, but Phillips County experienced a decline of almost 25 percent. The population loss in Phillips County reflects not only the decline in farmers but also the decline of small trade centers and consequent loss of population, labor force, and business to larger trade centers. In general, changes in the labor force follow the pattern set by population changes. There was a marked decrease in the number of persons employed on farms in all three counties between 1940 and 1960.

There was considerable improvement in personal income in the three counties from 1950 to 1960 (Table 17). In Yavapai County families with incomes over $5,000 increased from 15.5 percent in 1950 to 64.2 percent in 1960. In Cassia the increase was from 15.4 percent to 50.5 percent. Even in Phillips County the increase was from 17.0 percent to 40.6 percent. In all three counties the median family income rose by more than 40 percent during the same decade.

Retail trade expanded between 1948 and 1963--both the number of retail establishments and the volume of business increased (Table 18). However, the percentage increase in number of retail outlets was considerably less than for the mountain region as a whole but exceeded that of the United States. In average sales volume all three counties lagged behind their respective States, the mountain region, and the United States.

Wholesale establishments in minor trade area centers would logically tend to be smaller on the average than those in major trade centers. Such a tendency is indicated by the volume indexes which are consistently less for each of the three counties than those for larger geographic-economic areas (Table 19).

Cassia County had the best wholesale trade situation. It not only had the largest, absolute wholesale trade volume increase but also the largest relative increase and a competitive volume increase. Wholesaling in Phillips County was comparable to that in Cassia County but not to the same degree, partially because of a decline in the number of wholesalers. In Yavapai County, wholesaling not only had the smallest absolute and relative growth, but it also had a competitive decline. Trade area competition was partially responsible, but an increased number of wholesalers was the primary reason.

Service establishments were not very numerous in the three counties (Table 20), and small increases in numbers resulted in relatively large percentage increases. However, increases in numbers were fewer than those in larger economic and geographic areas.

The average sales volume also rose in each county, but again the small base resulted in a large percentage increase. Yet the increase in each case was only about half that of the related State and was only about one-third that of the region and nation. Volume indexes for the three counties sharply declined between 1948 and 1963, and the gaps between them and their related larger areas widened.

Manufacturing increased considerably in Yavapai County between 1954 and 1963 (Table 21). The number of manufacturing firms increased from 22 to 39, or 78 percent; the value added by manufacturing rose from $1,550,000 to $7,099,000, or about 350 percent; and the number of regular employees increased from 299 to 499, or 67 percent. Major areas of advance were (1) stone, clay, and glass products, from 3 to 12 firms; (2) lumber and wood products, from 2 to 8 firms; and (3) equipment manufacturing, from 2 to 5 firms.

In Cassia County four new manufacturing firms started business between 1954 and 1963, a one-third increase, but both the value added ($1,099,000 to $9,165,000) and regular employment (184 to 1,496) were slightly over eight times greater in 1963.

The changes in numbers of firms in various manufacturing categories were rather diverse in Cassia and Yavapai Counties. Increased industrial activity in both counties bolstered their economies and helps to explain, at least in part, their population increases and better personal income situation in comparison with Phillips County.

Retail and selected services sales volume per capita and also population per retail and selected service establishment are presented in Table 22 for each of the selected counties and its related State. As is to be expected, none of the counties compares favorably with its respective State. These counties were selected as representative of the many rural counties in the West that lack natural resources, transportation, favorable location and climate, water, or other essentials for economic growth.

It was hoped that a study of these counties would reveal how the development of arable federal lands might contribute to the economic viability of each. What has been revealed is something of the complexity of simple, largely rural economies that are becoming still more rural under influences beyond their control. Increases in cropland may have slowed the downward trend in economic activities, but they have not reversed it. The development of new farms out of the 1.5 million acres of arable federal lands is not likely to reverse this trend either. At best, it may slow it by some imperceptible amount.

CHANGES IN THE PUBLIC SECTORS OF THREE COUNTIES

Despite the slight gain in population in Yavapai and Cassia Counties, per capita expenditures for public services increased (Table 23). In Phillips County, which had the highest costs of the three, the increase was partially due to a population decline. As is to be expected, all three counties placed heavy reliance on property taxes which were highest in Phillips County. Moreover, Phillips had the lowest per capita income as well as the highest per capita taxes. Its citizens paid 19 percent of their income for local taxes as compared with 12 percent in the other two counties.

What is the reason for these differences? Phillips County has only one-third the population of Cassia and only one-fifth the population of Yavapai. What is involved here is the "social cost of space" noted by Kraenzel.[3] The more sparsely populated the area, the higher the "social cost of space"—which will tend to be still higher if functions of State and local government in sparsely populated areas are made equivalent to those in more populous areas. The social cost of space is not necessarily confined to social services or to services of government; it is also an inhibiting factor to economic development or community growth and is a partial explanation of differences in incomes in areas of low and high population density.

PROBABLE EFFECTS OF NEW FEDERAL LANDS ON THE SELECTED COUNTIES

An input-output analysis for each of the selected counties was not attempted. Output multipliers for most counties would be smaller than those for their States. Only in exceptional situations will some county output multipliers exceed those of the State. However, to illustrate the effect of developing new agricultural land on the county level, the State output multiplier will be used even though this will overstate the impact.

In Phillips County, Montana, the Soil Conservation Service estimated that 23,500 acres of federal lands were suitable for dryland crop production. What would this land produce? A study of several farm plans for northeastern Montana indicated that a wheat fallow rotation with some alfalfa and about one-fourth of the land in the federal conservation reserve program would gross $12 to $14 an acre including government payments.[4] Wheat yields and price were assumed to be 13 bushels per planted acre at $1.75 a bushel.

If the new federal lands could gross $15 an acre, the 23,500 available acres would give a direct output of $352,500, or 3.9 percent of the $9.1 million paid to farmers of Phillips County for their 1964 production.

Arizona has only 6,000 acres of federal lands suited for irrigated crop production for which water is physically and legally available. (It has no federal lands suited to dryland crop production.) Whether or not these lands can be economically irrigated in unknown. Also unknown is how many of these 6,000 acres, if any, are in Yavapai County. Hence, to attempt an estimate of the direct and indirect effects of crop production would be to speculate upon a speculation. Obviously, however, if all 6,000 acres happened to be located in Yavapai County, there would be considerable impact upon the local community.

Idaho is reported to have 389,000 acres of arable federal lands--83,000 acres usable for dryland and 306,000 acres for irrigated crop production. How much of this is in Cassia County? No estimates are available, but with so much irrigable federal land in the State, it seems quite reasonable to believe that Cassia might have as much as 30,000 acres suitable for irrigation. If a three-year potato, oat, alfalfa rotation were used, the direct output can be calculated as follows:

Crop	Acres	Yield/acre	Price	Total value
Potatoes	10,000	200 bushels	$ 1.75	$3,500,000
Oats	10,000	50 bushels	.60	300,000
Alfalfa	10,000	6 tons	17.00	1,020,000
Total direct effect				$4,820,000

The total direct effect would be about $5 million as compared with $33 million in farm product sales for Cassia County (U.S. Census of Agriculture, 1964). If a multiplier of 1.30 were used, the total direct and indirect output effects would be $6.5 million for the 30,000 acres. Obviously, either of these amounts would have a significant effect on the economy of Cassia County.

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[3] Kraenzel, Carl F. The Great Plains in Transition (Norman: University of Oklahoma Press, 1955), pp. 201 ff.

[4] LeRoy C. Rude, Land Use Alternatives for Dryland Grain--Livestock Operators in Northeastern Montana, Montana Agricultural Experiment Station Bulletin 572 (1962).

SUMMARY AND CONCLUSIONS

What probable effect would the development of 1.5 million acres of arable federal lands have on the economy of the West? Of each of the 11 Western States? Of three selected counties in central Arizona, southern Idaho and northeastern Montana? These are the questions this study sought to answer.

The 11 Western States have 37 million acres of harvested cropland. Obviously, an increase of 1.5 million acres, or only 4 percent would not have a large impact on the region. Among the 11 States the effect would be greatest in Wyoming with 590,000 acres and Idaho with 390,000 acres. In evaluating the impact one should keep in mind that less than 10 percent of the income of the West comes from livestock and crops. Sources of income are as follows:

Source	Percent
Livestock	3
Other agriculture	6
Agricultural processing	7
Mining and manufacturing	29
Services and utilities	28
Trade and transportation	21
Other industry	6
Total	100

The share of income received by the various States from livestock and other agriculture is as follows:

State	Livestock	Other agriculture	Total
	- - - - - - - - Percent	- - - - - - - -	
Idaho	5	13	18
Montana	7	11	18
Arizona	4	9	13
Colorado	4	9	13
Oregon	4	4	8
Wyoming	4	4	8
New Mexico	4	3	7
California	2	4	6
Nevada	1	3	4
Washington	1	3	4
Utah	2	1	3

This study indicates that the 1.5 million acres of arable federal lands might directly produce 85 million dollars of products at current yields and prices. However, this amount would increase the value of all crops harvested in the West by only 2.0 percent (Table 10).

A number of studies of the economies of several Western States suggests that the direct effect of 85 million dollars should be multiplied by 1.36 to account for the increased economic activity such production would stimulate. If so, the total output effect would be 115 million dollars. While this is a large amount, it is only 0.2 percent increase over the present value of all production (agricultural and other) in the 11 Western States (Table 11).

Wyoming and Idaho, with little cropland and considerable arable federal lands, would have the greatest increases in value of all crops harvested. The millions of dollars of crops now produced in the 11 Western States and the percentage increases that might result if federal lands were developed are as follows:

State	Private harvested cropland	Crops from federal land	Percentage increase
	- - - - - million dollars	- - -	
Wyoming	75	24	32.0
Idaho	360	37	10.0
Colorado	262	7	2.6
Oregon	247	4	1.7
Washington	474	6	1.3
Montana	306	3	1.0
Arizona	272	1	0.2
California	2,077	2	0.2
New Mexico	116	(a)	0.1
Utah	81	(a)	0.1
Nevada	28	0	0.0

[a] Less than $500,000.

The direct effects of the new crops are indicated above in millions of dollars. Studies have shown that for every $100 of new crops produced, the indirect effects on other sectors of the economy make the total output effect range from $123 to $192. Stated more technically--the direct effect needs to be multiplied by an output multiplier of 1.23 to 1.92 (Table 9). The average multiplier for these 11 Western States appears to be about 1.40. Thus for every $100 of crops produced, another $40 of indirect benefits makes a total output effect of $140. But even after these indirect effects are taken into account, the $115 million total output effect is only 0.2 percent of the value of all production (agricultural and other).

An attempt was made to determine the probable effects of the development of arable federal lands on three selected counties: Yavapai in west central Arizona, Cassia on the southern border of Idaho, and Phillips in northeastern Montana. The statistics indicated changes in acres of harvested cropland, but it was impossible to ascertain how much these changes affected trends in population. Studies to determine the output multipliers of these counties were also lacking.

In Phillips County, a $15 gross return per acre seems possible on the 23,500 acres of arable federal lands in that county. With this return the direct output would be $352,000, or 3.9 percent of the $9,100,000 that Phillips County farmers received for their cash sales. If the output multiplier that should be used to account for indirect effects is lower than for that for the State, say 1.30, then the total output effect would be $458,000.

In Arizona there are only 6,000 acres of arable federal lands and all these require irrigation. The possibility that much of this land is in Yavapai County does not seem large. Hence no analysis was attempted.

Since Idaho has 389,000 acres of arable federal lands, it seems probable that as much as 30,000 acres might be in Cassia County. An irrigated potato--small grain--alfalfa rotation would give a direct output of $5 million as compared with $33 million cash sales by Cassia County farmers in 1964. If the output multiplier were 1.30, then the total output effect would be $6.5 million.

Would these direct and indirect effects justify bringing the arable federal lands into production at this time? The answer depends on alternative possiblities and their comparative costs and benefits. One factor not considered in this paper is the relatively high cost of bringing these lands into production. Another factor not included is the division of the costs of development between individuals and governments or between local areas and the nation.

In general, the evidence seems to indicate that the effects of developing such lands would be economically beneficial to the local areas, at least in the short run. However, these economic gains may not be so great as many people expect them to be.

Table 1.--Effect of available federal lands suited for crop production on total harvested cropland of 17 Western States, 1968

States	Federal public land suited for crop production[a]					Non-federal harvested cropland[c]	Increase in total cropland
	Dryland	Irrigated	Available for crops[b]				
			Dryland	Irrigated	Total		
	- - - - - - - - - -	- - - - - - -	- - 1,000 acres - -	- - - - - -	- - - - -	- - - - -	Percent
Arizona	0	11	0	6	6	1,025	0.6
California	172	137	4	20	24	7,646	0.3
Colorado	103	88	103	86	189	4,726	4.0
Idaho	85	314	83	306	389	3,935	10.0
Montana	279	6	105	5	110	7,813	1.4
Nevada	4	7	0	3	3	507	0.5
New Mexico	(d)	11	0	0	0	906	---
Oregon	67	72	60	23	82	3,050	2.7
Utah	1	14	0	1	1	1,039	0.1
Washington	15	158	3	104	107	4,423	2.4
Wyoming	469	387	203	387	590	1,702	34.6
Sub-total	1,195	1,204	561	940	1,502	36,972	4.1
Kansas	99	43	26	0	26	18,160	0.1
Nebraska	10	5	1	1	2	15,229	0.01
North Dakota	262	4	22	0	22	17,695	0.1
Oklahoma	44	3	3	0	3	8,344	0.3
South Dakota	237	46	31	0	31	14,445	0.2
Texas	149	6	61	0	61	19,403	0.3
Total	1,996	1,313	705	941	1,646	130,248	1.3

[a] Volume IV of this report, Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States, Table 2. [b] Only lands held by three agencies--Bureau of Reclamation, Bureau of Land Management and Corps of Engineers--are considered available for crop production. [c] U.S. Bureau of the Census, Census of Agriculture, 1964, Vol. 2, Chap. 3, pp. 248-49. [d] Less than 500 acres. Note: Figures are rounded and do not add to totals shown.

Table 2.--Percentage share of selected industry groups in total net economic activity in 11 Western States

State	Livestock	Other agriculture	Agricultural processing	Mining & mfg.	Services & utilities	Trade & transport	Other industry	Total
Arizona	4	9	5	25	39	18	---	100
California	2	4	10	36	12	16	20	100
Colorado	4	9	5	25	39	18	---	100
Idaho	5	13	14	27	14	18	9	100
Montana	7	11	14	27	14	18	9	100
Nevada	1	3	2	10	67	16	1	100
New Mexico	4	3	4	34	32	23	---	100
Oregon	4	4	10	43	27	8	4	100
Utah	2	1	5	25	15	47	5	100
Washington	1	3	8	37	18	20	13	100
Wyoming	4	4	4	35	27	26	---	100
Average	3	6	7	29	28	21	6	100

Source: Unpublished input-output study furnished by the Public Land Law Review Commission.

Table 3.--Irrigated land as a percentage of total harvested cropland and irrigable land as a percentage of arable federal land in 11 Western States

States	(1) Total harvested cropland[a]	(2) Total arable federal lands[b]	(3) Irrigated land as a percentage of col. (1)[c]	(4) Irrigable land as a percentage of col. (2)
	- - - - 1,000 Acres - - -		- - - - Percent - - - - -	
Arizona	1,025	6	100	100
California	7,846	20	97	93
Colorado	4,726	86	57	46
Idaho	3,935	306	71	79
Montana	7,813	5	24	4
Nevada	507	2	100	100
New Mexico	906	0	90	0
Oregon	3,050	23	53	25
Utah	1,039	1	100	100
Washington	4,423	104	26	97
Wyoming	1,702	388	92	66
Totals	36,972	1,501	58	63

[a] U.S. Census of Agriculture, 1964, Vol. 2, Chap. 3, pp. 248-49.

[b] Table 1 of this report.

[c] U.S. Census of Agriculture, 1964, Vol. 2, Chap. 9, p. 916 (acres).

Table 4.--Probable use of available federal land in crop production in 11 Western States

State	Corn	Oats	Barley	Sorghum	Wheat	Rye	Rice	Cotton	Potatoes	Beans	Peas	Beets	Total
	acres												
Arizona	240	---	1,380	1,920	420	---	---	1,860	60	---	---	120	6,000
California	1,708	1,952	8,540	2,440	1,952	---	1,952	3,172	488	976	---	1,220	24,400
Colorado	17,037	3,786	9,465	22,716	119,259	1,893	---	---	1,893	7,572	---	5,679	189,300
Idaho	11,679	7,786	77,860	---	194,650	3,893	---	---	42,823	11,679	15,572	23,358	389,300
Montana	1,101	4,404	22,020	---	81,474	---	---	---	---	---	---	1,101	110,100
Nevada	275	450	875	---	875	---	---	---	25	---	---	---	2,500
New Mexico	---	---	---	---	---	---	---	---	---	---	---	---	---
Oregon	1,642	7,389	13,957	---	50,902	4,105	---	---	2,463	---	821	821	82,100
Utah	99	55	264	---	594	---	---	---	11	22	---	55	1,100
Washington	1,606	1,821	6,854	---	88,143	1,500	---	---	1,928	214	3,534	1,500	107,100
Wyoming	41,279	94,352	88,455	---	271,262	23,588	---	---	---	29,485	---	41,279	589,700
Totals	76,566	122,095	229,670	27,076	809,531	34,979	1,952	5,032	49,691	49,948	19,927	75,133	1,501,600

Source: For total acres of available federal lands see Table 1. Note: Crops were distributed on the basis of planted non-federal cropland as reported in Crop Production, 1968 Annual Summary by States, U.S. Department of Agriculture, Statistical Reporting Service, 19 December 1968, p. 45 ff. For distribution see appendix tables in Volume IV, Working Paper on Federal Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980 and 2000, of this report.

Table 5.--Crop yields per acre in 11 Western States, 1949 to 1967

State	Corn	Oats	Barley	Sorghum	Wheat	Rye	Rice	Cotton	Potatoes	Beans	Peas	Beets
	bushels						lbs.	lbs.	cwt.	lbs.	lbs.	tons
Arizona	25	49	60	58	35	--	--	930	232	446	--	20
California	67	37	42	59	24	12	4,170	910	270	1,389	1,236	20
Colorado	49	35	30	22	18	11	--	--	211	860	898	16
Idaho	68	47	37	--	34	19	--	--	193	1,746	1,355	18
Montana	33	35	28	--	20	16	--	--	150	1,608	--	14
Nevada	45	43	41	--	36	--	--	665	198	--	--	--
New Mexico	29	31	38	33	16	11	--	643	141	538	--	--
Oregon	61	37	37	--	31	17	--	--	232	--	1,093	24
Utah	58	49	46	--	23	10	--	--	155	436	--	16
Washington	76	48	38	--	33	16	--	--	274	1,787	1,315	23
Wyoming	36	34	33	--	20	14	--	--	143	1,444	--	15

Source: Crop Production, 1968 Annual Summary by States, U.S. Department of Agriculture, Statistical Reporting Service, 19 December 1968 and earlier reports.

Table 6.--Estimated production on available federal lands by crops in 11 Western States

State	Corn	Oats	Barley	Sorghum	Wheat	Rye	Rice	Cotton	Potatoes	Beans	Peas	Beets
	1,000 bushels						tons					
Arizona	6	--	83	112	15	--	--	865	696	--	--	2
California	114	73	357	143	47	--	4,070	1,444	6,588	678	--	24
Colorado	833	131	286	496	2,123	21	--	--	19,971	3,258	--	92
Idaho	790	369	2,850	--	6,560	72	--	--	413,242	10,195	10,552	425
Montana	36	155	628	--	1,638	--	--	--	--	--	--	16
Nevada	12	20	36	--	31	--	--	--	248	--	--	--
New Mexico	--	--	--	--	--	--	--	--	--	--	--	--
Oregon	100	276	511	--	1,573	70	--	--	28,571	--	449	20
Utah	6	3	12	--	14	--	--	--	85	5	--	1
Washington	122	87	262	--	2,918	25	--	--	26,414	191	2,323	35
Wyoming	1,478	3,199	2,954	--	5,317	323	--	--	--	21,287	--	598
Totals	3,497	4,311	7,979	757	20,233	411	4,070	2,310	495,814	35,613	13,324	1,213

Source: Derived from Tables 4 and 5. Note: Figures are rounded and do not add to totals shown.

Table 7.--Estimated value of crop production on available federal lands by crops in 11 Western States

State	Corn	Oats	Barley	Sorghum	Wheat	Rye	Rice	Cotton	Potatoes	Beans	Peas	S. Beets	Totals
	1,000 dollars												
Arizona	6	--	75	108	19	--	--	373	28	--	--	37	645
California	120	44	321	137	59	--	400	622	269	55	--	376	2,403
Colorado	875	80	257	476	2,675	21	--	--	815	263	--	1,410	6,872
Idaho	829	225	2,565	--	8,265	71	--	--	16,860	822	1,030	6,517	37,185
Montana	38	94	565	--	2,063	--	--	--	--	--	--	241	3,001
Nevada	13	12	33	--	39	--	--	--	10	--	--	--	107
New Mexico	--	--	--	--	--	--	--	--	--	--	--	--	--
Oregon	105	168	460	--	1,982	69	--	--	1,166	--	44	299	4,292
Utah	6	2	11	--	17	--	--	--	4	--	--	14	53
Washington	128	53	236	--	3,676	24	--	--	1,078	15	227	530	5,967
Wyoming	1,552	1,951	2,659	--	6,699	320	--	--	--	1,717	--	9,175	24,073
Totals	3,671	2,630	7,181	721	25,494	506	400	995	20,229	2,873	1,380	18,598	84,599

Source: Table 6 and prices received by farmers, December 1968. Note: Figures are rounded and do not add to totals shown.

Table 8.--Selected output multipliers for agricultural production and processing in 11 Western States

State	Range livestock	Other livestock	Crops	Cotton	Vegetables	Other agr.	Agr. proc.
Arizona	1.31	1.39	1.32	--	--	--	1.93
California	1.47	--	1.45[a]	1.24	1.20	1.38	--
Colorado	1.18	1.42	1.32	--	--	--	1.89
Idaho	1.50	--	--	--	--	1.35	1.67
Montana	1.40	--	--	--	--	1.35	1.34
Nevada	1.44	1.75	1.72	--	--	--	2.39
New Mexico	1.30	--	1.30	1.42	1.17	--	1.29
Oregon	1.90	--	--	--	--	1.92	--
Utah	1.79	--	--	--	--	1.52	--
Washington	1.37	--	1.23	--	1.22	--	--
Wyoming	--	--	1.28	1.45	1.15	--	1.25
Averages	1.47	1.52	1.36	1.37	1.18	1.50	1.68

Source: Output multipliers supplied by the Public Land Law Review Commission.

[a] Food and feed grain multiplier.

Table 9.--Total output effect of increased crop production from arable federal lands in 11 Western States

State	Estimated direct output effect[a]	Output multiplier[b]	Total output effect
	1,000 dollars	Ratio	1,000 dollars
Arizona	646	1.32	852
California	2,403	1.45	3,484
Colorado	6,872	1.32	9,071
Idaho	37,185	1.35	50,200
Montana	3,001	1.35	4,052
Nevada	107	1.72	184
New Mexico	---	1.30	---
Oregon	4,292	1.92	3,241
Utah	53	1.52	81
Washington	5,967	1.23	7,339
Wyoming	24,073	1.28	30,813
Totals	84,599	---	114,317

[a] See Table 7, last column. [b] See Table 7. The output multiplier for "other agriculture" was used for Idaho, Montana, Oregon and Utah because a "crops" multiplier was lacking. The California output multiplier is for food and feed grains.

Table 10.--Probable effect of new federal lands on total value of farm crops harvested in 11 Western States, 1967

States	Value of all crops harvested[a]	Value of crops from new federal land[b]	Increase in value due to federal lands
	- - - - -1,000 dollars- - - - - -		Percent
Arizona	272,300	646	0.2
California	2,076,600	2,403	0.2
Colorado	261,600	6,872	2.6
Idaho	359,900	37,185	10.0
Montana	305,700	3,001	1.0
New Mexico	116,400	107	0.1
Nevada	28,100	- - -	- - -
Oregon	247,400	4,292	1.7
Utah	81,000	53	0.1
Washington	473,800	5,967	1.3
Wyoming	74,100	24,073	32.0
Total	4,297,900	84,599	2.0

[a] *Agricultural Statistics*, 1968.

[b] Data from Table 9. Note that these figures do not include multiplier effect.

Table 11.--Probable impact of crop production from arable federal lands on total value of all production in 11 Western States

State	Total value of all production (agriculture and other)[a]	Total impact of crops produced on arable federal lands[b]	
	- - - 1,000 dollars - - -		Percent
Arizona	3,600,000	852	0.02
California	11,600,000	3,484	0.03
Colorado	3,600,000	9,072	0.30
Idaho	2,600,000	50,200	1.90
Montana	2,600,000	4,052	0.20
New Mexico	4,200,000	184	0.00
Nevada	3,200,000	0	0.00
Oregon	13,400,000	8,241	0.06
Utah	6,900,000	81	0.00
Washington	12,500,000	7,339	0.06
Wyoming	3,100,000	30,813	0.10
Totals	67,300,000	114,317	0.17

[a] Input-output data furnished by Public Land Law Review Commission.

[b] Data from Table 9. Note that these figures include the multiplier effect.

Table 12.--Changes in land use in three selected counties in Arizona, Idaho, and Montana, 1949 to 1964

	Yavapai County Arizona	Cassia County Idaho	Phillips County Montana
County land area, acres	5,178,000	1,628,000	3,346,000
Percentage in farms	68	41	68
Land in farms, 1964, acres	3,506,000	664,000	2,274,000
Increase since 1949, acres	905,000	199,000	492,000
Percentage increase	35	43	28
Total cropland, 1964, acres	28,000	316,000	372,000
Increase since 1949, acres	2,000	135,000	58,000
Percentage increase	8	75	44
Harvested cropland, 1964, acres	8,000	204,000	200,000
Change since 1949, acres	-4,000	+79,000	+66,000
Percentage change	-33	+63	+49

Source: U.S. Census of Agriculture, 1950, 1964.

Table 13.--Irrigated land and farms, farm employment, and farm labor in three selected counties, 1949, 1964

	Yavapai County Arizona	Cassia County Idaho	Phillips County Montana
Irrigated land, 1964, acres	14,813	189,664	45,776
Change from 1949, acres	+946	+89,273	+14,158
Percentage change	+7	+89	+45
Number of farms irrigated	252	898	260
Change from 1949	-51	-252	-27
Percentage change	-17	-22	-9
Average size of irrigated farm, acres	3,887	662	3,373
Change from 1949, acres	+1,625	+333	+1,265
Percentage change	+72	+101	+60
Percentage of farms irrigated			
1949	55	92	36
1964	55	92	42
Total farm workers, 1960, number	695	1,515	942
Change from 1940	-358	-359	-453
Percentage change	-34	-19	32
Projected number for 1970	533	1,095	709
Number of workers per farm			
1950	1.7	1.6	1.4
1960	1.5	1.3	1.4
Hired farm labor working 150 days or more per year			
Number, 1964	343	591	259
Change from 1949	+41	+170	-1
Percentage change	+14	+40	-0.4
Number of workers per commercial farm			
1949	0.8	0.4	0.4
1964	1.2	0.7	0.5

Source: U.S. Census of Agriculture, 1950, 1964.

Table 14.--Farm numbers and size, 1949 and 1964, in three selected counties

	Yavapai County Arizona	Cassia County Idaho	Phillips County Montana
Number of farms, 1964	460	978	621
Decrease from 1949	-87	-270	-182
Percentage decrease	-16	-22	-23
Average size of farms, 1964, acres	7,622	679	3,662
Increase from 1949, acres	+2,867	+307	+1,442
Percentage increase	+60	+82	+65
Trend projection to 1975			
Number of farms	386	836	488
Average size of farms, acres	9,910	881	4,560
Commercial farms			
Number, 1964	283	852	554
Decrease from 1949	-91	-287	-155
Percentage decrease	-24	25	-22
Number of farms by size brackets			
Under 260 acres, 1964	289	595	84
Change from 1949	-44	-387	-41
Percentage change	-13	-39	-33
260 to 1,000 acres, 1964	46	241	267
Change from 1949	-37	+81	-5
Percentage change	-45	+51	-2
Over 1,000 acres, 1964	125	142	270
Change from 1949	-6	+36	-136
Percentage change	-5	+34	-34

Source: U.S. Census of Agriculture, 1950, 1964.

Table 15.--Farm income and farm value, 1949, 1964, in three selected counties

	Yavapai County Arizona	Cassia County Idaho	Phillips County Montana
Farm income (realized net per farm)			
Farm income estimates, 1949 (State)			
All farms	$11,615	$ 3,396	$ 5,282
Commercial farms	15,794	4,007	5,932
County estimates			
All farms	5,983	4,509	4,156
Commercial farms	8,077	4,853	4,486
Farm income estimates, 1964 (State)			
All farms	18,589	4,551	4,486
Commercial farms	25,415	5,927	5,267
County estimates			
All farms	3,378	9,747	4,570
Commercial farms	5,400	10,825	5,081
Farm real estate values			
Value of land and buildings per farm, 1949	36,551	21,521	24,252
Value of land and buildings per farm, 1964	203,804	84,512	83,126
Value per acre, 1949	7.85	61.16	11.05
Value per acre, 1964	26.71	127.25	22.59
Increase ratio per farm	5.6	3.9	3.4
Increase ratio per acre	3.4	2.1	2.0

Sources: U.S. Census of Agriculture, 1950, 1964, Economic Research Service, U.S. Department of Agriculture.

Table 16.--Population and labor force, 1960, and changes from 1940 in selected counties

	Yavapai County Arizona	Cassia County Idaho	Phillips County Montana
Population			
Total, 1960	28,912	16,121	6,027
Change from 1940	+2,401	+1,691	-1,865
Percentage change	+9	+11	-24
Urban, 1960	12,861	7,508	2,239
Change from 1940	+6,843	+2,179	+24
Percentage change	+114	+41	+1
Rural, 1960	14,300	3,383	1,536
Change from 1940	-2,872	+1,354	-452
Percentage change	-16	+67	-23
Farm, 1960	1,751	5,230	2,252
Change from 1940	-1,570	-1,842	-1,437
Percentage change	-47	-26	-39
Labor Force			
Number in labor force, 1960	10,461	6,196	2,380
Change from 1940	+644	+1,324	-814
Percentage change	+7	+27	-26
Proportion of labor force employed in agriculture			
1940 Percentage	11	38	47
1960 Percentage	7	24	40
Number employed on farms, 1960	681	1,430	903
Change from 1940	-318	-300	-409
Percentage change	-32	-17	-31

Source: U.S. Census of Population, 1960.

Table 17.--Personal income, 1950, 1960, in selected counties

Personal income	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Families by income classes	1950	1960	1950	1960	1950	1960
	- - - - - - Numbers - - - - - -					
Under $3000	2,950	1,051	1,880	775	770	443
$3000-4999	2,245	1,648	935	1,134	425	418
$5000-9999	825	3,949	415	1,590	200	479
Over $10,000	125	894	95	355	45	109
Families by income classes	- - - - - - Percent - - - - - -					
Under $3000	48	14	56	20	54	31
$3000-4999	36	22	28	29	30	29
$5000-9999	14	52	12	41	14	33
Over $10,000	2	12	3	9	3	8
Median family income, 1950	$3,081		$2,698		$2,844	
Median family income, 1960	5,191		5,032		4,353	
Median farm family income, 1960	3,984		5,018		3,952	
Mean personal income per recipient, 1960						
Income from all sources	3,367		3,005		3,827	
Income from wages or salary	3,268		2,304		2,148	
Income from self employment	3,918		3,779		3,848	
Per capita personal income, 1960	1,780		1,424		1,375	

Source: U.S. Census of Population, 1950, 1960.

Table 18.--Retail trade, 1963, with changes from 1948 in selected counties

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Number of establishments, 1963	455		237		103	
Change from 1948	+31		+41		+5	
Percentage change						
Selected county	+7		+21		+5	
Related State	+60		-.2		-4	
Mountain region	+16		+16		+16	
United States	+3		+4		+4	
Average sales volume per establishment, 1963	$86,571		$131,291		$82,728	
Change from 1948	+30,203		+49,169		+22,412	
Percentage change						
Selected county	+54		+60		+37	
Related State	+92		+63		+67	
Mountain region	+88		+88		+88	
United States	+94		+94		+94	
Volume indexes	1948	1963	1948	1963	1948	1963
Mountain region	100	100	100	100	100	100
Selected county	72	60	105	90	77	56
Related State	105	107	102	88	95	85
United States	95	98	95	98	95	98

Source: U.S. Census of Retail Trade, 1948, 1963.

Table 19.--Wholesale trade, 1963, with changes from 1948 in selected counties

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Number of establishments, 1963	46		43		17	
Change from 1948	+10		--		-6	
Percentage change						
Selected county	+28		--		-26	
Related State	+154		+28		+14	
Mountain region	+54		+58		+54	
United States	+27		+27		+27	
Average sales volume per establishment, 1963	$303,935		$477,186		$258,588	
Change from 1948	+85,157		+214,372		+100,805	
Percentage change						
Selected county	+39		+82		+64	
Related State	+67		+46		+26	
Mountain region	+51		+51		+51	
United States	+50		+50		+50	
Volume indexes	1948	1963	1948	1963	1948	1963
Mountain region	100	100	100	100	100	100
Selected county	44	41	53	64	32	34
Related State	98	109	73	71	85	71
United States	156	155	156	155	156	155

Source: U.S. Census of Wholesale Trade, 1948, 1963.

Table 20.--Selected services, 1963, with changes from 1948 in selected counties

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Number of establishments, 1963	261		121		41	
Change from 1948	+107		+40		+16	
Percentage change						
Selected county	+70		+49		+64	
Related State	+156		+70		+48	
Mountain region	+91		+91		+91	
United States	+60		+60		+60	
Average sales volume per establishment, 1963	$20,789		$18,074		$15,902	
Change from 1948	+6,114		+5,852		+3,102	
Percentage change						
Selected county	+42		+50		+24	
Related State	+96		+69		+47	
Mountain region	+112		+112		+112	
United States	+110		+110		+110	
Volume indexes	1948	1963	1948	1963	1948	1963
Mountain region	100	100	100	100	100	100
Selected county	78	52	65	45	68	40
Related State	100	93	87	69	83	58
United States	106	105	106	105	106	105
Total sales volume, 1963						
Retail trade	$39.4		$31.1		$ 8.5	
Wholesale trade	14.0		20.5		4.4	
Selected services	5.4		2.2		.7	
Total	$58.8		$53.8		$13.6	

Source: U.S. Census of Selected Services, 1948, 1963.

Table 21.--Manufacturing and mining, 1963, with changes from 1954 in selected counties

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Manufacturing	1954	1963	1954	1963	1954	1963
Number of firms	22	39	12	16	3	3
Value added (thousands)	1,550	7,099	1,099	9,165	86	162
Number of regular employees	299	499	184	1,496	13	17
Number of firms by category						
Food & kindred products (20)	6	6	5	7	--	--
Apparel & related products (23)	2	1	1	1	--	--
Lumber & wood products (24)	2	8	--	--	--	--
Furniture & fixtures (25)	1	--	--	--	--	--
Paper & allied products (26)	--	--	--	1	--	--
Printing & publishing (27)	4	4	4	3	--	--
Stone, clay, glass products (32)	3	12	1	2	--	--
Primary metal industry (33)	--	1	--	--	--	--
Machinery, except electrical (35)	2	2	--	1	--	--
Light industry (36) (37) (38)	--	3	--	--	--	--
Unchanged categories (misc.)	2	2	1	1	--	--
Mining						
Number of firms	73	30	2	1	2	5
Value added (thousands)	9,600	12,540	NA	NA	NA	NA
Number of regular employees	700	833	NA	NA	NA	NA

Source: U.S. Census of Manufacturing and Mining, 1954, 1963.

NA--Not available (census data is not published so as to avoid disclosure for individual firms).

Table 22.--Retail and selected services volume per capita with population per retail and selected service establishment in selected counties, 1948 and 1963

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
Retail volume per capita	State	County	State	County	State	County
1948	877	956	988	1,100	1,020	933
1963	1,549	1,362	1,420	1,930	1,431	1,414
Selected services volume per capita						
1948	89	90	73	68	78	51
1963	257	188	185	136	149	108
Population per retail establishment						
1948	93	59	80	75	73	65
1963	101	64	91	68	87	59
Population per service establishment						
1948	213	162	224	181	200	253
1963	144	111	150	133	155	147

Source: Derived from data in previous tables.

Table 23.--Costs of local governments in three selected counties, 1957 and 1962

	Yavapai County Arizona		Cassia County Idaho		Phillips County Montana	
	1957	1962	1957	1962	1957	1962
Estimated population	27,735	30,740	15,670	16,745	6,120	5,850
Per capita direct general expenditures	$165	$206	$139	$190	$193	$229
Per capita tax revenues, total	153	213	145	166	212	259
Property taxes	68	111	53	87	126	168
Other taxes	9	11	2	2	11	7
Miscellaneous	24	19	53	34	47	36
Intergovernmental (net)	51	72	36	43	28	48
Personal income per capita, 1960	$1,780		$1,424		$1,375	
Property tax as percentage of total revenue	45	52	37	53	60	65
Property tax as percentage of personal income		6		6		12
Tax revenue as percentage of personal income		12		12		19

Source: United States Census of Governments, Governmental Finances, 1957, 1962. Per capita data were computed on the basis of aggregates.

PART V: ANALYSIS OF THE EXISTING SYSTEM AND OF ISSUES AND ALTERNATIVES

There is much to be learned about the public lands from both past experiences and the current situation which can assist us in making policy decisions for the future. In this concluding part of the Final Report some of these lessons are brought to bear on the issues and alternatives. To do this efficiently it seems desirable to present first some additional background material which has relevance to several of the issues, and second to provide somewhat more information concerning approaches to the analysis than was given in Part I.

A. ADDITIONAL HISTORICAL INFORMATION

Great Britain, France, Spain, and Russia all required huge areas of land in North America, and all except Great Britain lost, ceded or sold all their lands to the United States. These fantastic acts of wholesaling and retailing a continent of real estate provide many insights into present retention and disposal problems and will be briefly reviewed.

Some Early Land Disposal Methods in the Colonies

Great Britain established its ownership of what became the original 13 colonies by right of discovery and ability to repel France and Spain as rival claimants. To help maintain control over these lands the British government made very liberal grants to the proprietors of the colonies, and in turn the proprietors granted lands to others under what today appears to be extraordinary liberal terms; but, considering the circumstances of the time, such terms may have been all the traffic would bear. Land was available in great abundance and often could be had for the taking. Squatting on public lands was a common occurrence; and since the land that was available usually produced only a precarious living, especially during the first years of development, its market value was virtually nothing. Why should a settler pay rent for lands that were to be had for the taking? Why should he pay a high purchase price for land that was little if any better than that a little further up the river, in the forests, or over the mountains?

In Virginia the headright system provided each person who came to the colony 50, and later 100, acres of land without cost. In the New England colonies groups of settlers were granted a township which they then divided among their members. In New York large grants were made to individuals who then subdivided the land and offered it for rent or sale but found few renters or buyers. In Maryland and Pennsylvania cash sales were used where and when buyers could be found--usually for the better lands.

Acquisition of Federal Domain Lands[1]

One of the causes of the Revolutionary War was the efforts of Great Britain to enforce a uniform land disposal system in all 13 colonies. While uniformity had merit, the right of the Mother Country to control these lands raised the question, "whose public lands?"

While the Revolutionary War and the Treaty of Paris of 1783 resolved the conflict between the Crown and its colonies over the control and dispersal of the public lands, a new struggle began between the new central government and the new States. By the time of the Consitutional Convention of 1787 the States had been persuaded of the necessity of ceding or granting their claims to western lands to the new federal government.

At first thought these grants may appear to be inconsistent with the rejection of the British government's attempt to control the disposal of public lands in the colonies. But in one way it was wholly consistent. The seven States with claims to lands west of the Alleghenies were from an administrative standpoint about as far removed from these lands as was the British Parliament from its colonies along the Atlantic coast. The original thirteen States did retain the right to dispose of public lands within their boundaries.

To be wholly consistent the federal government should have granted to the new western States all the federal lands located within their boundaries for management and disposal. But there was one very good reason why this was not done. The federal government was financially weak, and its lands proved to be a most useful source of revenue that probably could not have been collected without great cost to the nation by any other means.

Gates makes clear that "by the cession of the western land claims the United States acquired ownership of a supply of land that was to be of paramount importance in the growth of national power, in attracting millions of Europeans to settle in the new communities of the American West, in creating transportation ties binding these new communities to the older ones and in making possible the foundation of a common school system, state universities, colleges of agriculture and mechanical arts. The transfer of these territories probably did more than anything else at the time to give prestige to the government. Long before Congress could bring itself to vote funds in aid of internal improvements such as roads, turnpikes, canals, and railroads, or to subsidize education, or to assist the States to build their capitals, drain wet areas, irrigate dry areas and promote forestation, it could do all these things by granting public lands under the guise of adding to the value of the remaining public lands".[2]

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[1] Paul W. Gates, History of Public Land Law Development, Public Land Law Review Commission (Washington, D.C.: U.S. Government Printing Office, 1968), Chapter 1.

The State cessions totaling 233 million acres were only a small part of the federal public domain of 1,808 million acres eventually acquired. Of this overall total about 1,136 million acres were in the western States.[3]

Disposal of Federal Public Lands, 1782-1967

A brief review of federal land disposal for crop production suggests that it has been quite successful. Between 1782 and 1967 the federal government disposed of 1,043 million acres of public lands as follows:

Method of disposal	Million acres	Percent
Public, private, preemption sales, etc.	302	29
Granted or sold to homesteaders	287	28
Granted to States	229	22
Granted to railroad corporations	93	9
Granted to veterans (military bounties)	61	6
Confirmed as private land claims	34	3
Sold under timber and stone laws	14	1
Granted or sold under timber culture law	11	1
Sold under Desert Land Act	11	1
Total disposal, 1781-1967	1,043	100

As shown, public, private and preemption sales were used to dispose of 29 percent of these lands. Grants or sales to homesteaders were second in importance. Many homestead entries were commuted (purchased)

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[2] Gates, History of Public Land Law, p. 56.

[3] Part II A, Table 1.

for $1.25 an acre or $200 per quarter section of 160 acres.[4] But even the homesteads were not cheap because the homesteader was obligated to settle on the land, bring some of it under cultivation under difficult circumstances, and establish a home. In many cases these obligations probably constituted a fair price for the land.

Grants to States were third in importance as a disposal method. While these grants did not call for payment in money, the States were expected to use the proceeds from the lands to achieve certain specific purposes as follows:

	Million acres
Support of common schools	78
Reclamation of swampland	65
Construction of railroads	37
Support of miscellaneous institutions	22
Canals and rivers	6
Construction of wagon roads	3
All other purposes	18
Total	229

The 93 million acres granted to railroads were also free in the sense that there was no dollar payment, but these corporations were placed under obligation to build railroads into areas where they otherwise might not have built them for many years. It is possible that more land was granted than necessary in some cases, but this is by no means certain. In any event, it is not correct to say that the land was a free gift to railroad corporations.

Even the lands granted to veterans were not necessarily free gifts. The veterans had performed a service for the nation, and the military bounties were payments in kind rather than in money for their services. Actually, many of these claims on land were sold and thus were converted into money payments. Perhaps these grants were too generous, but apparently they did not seem so at the time or they probably would not have been made.

Despite the general success of disposal efforts, there has been much criticism of the methods used and charges of abuse. Yet despite the variety of methods and purposes, most of these lands quickly found their way into the hands of farmers and ranchers. There is no clear evidence that speculators or wholesalers made unfair or unusual profits in the process. As in any business a few made spectacular profits while most made only normal returns, and some had heavy losses. Swierenga shows that in Iowa the annual net rate of return was high during the period 1846-1865 but after 1865 the returns were about the same as good commercial paper.[5]

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[4] Gates, History of Public Land Law, p. 798.

Homestead Laws: Were they Necessary to Settle the West?

The homestead laws required the applicant to swear that he desired to enter the land for actual settlement and cultivation and to obtain a home for himself. Robbins concluded that "the homesteading movement had received its greatest impetus from the fact that free land would promote the settlement of the plains."[6] Were these laws really necessary to settle the plains, or would they have been settled in any event? Robbins recognized that this as "an interesting problem" but pursues it no further. Gates presents clear evidence that they would have been settled without the homestead laws. The following figures indicate, for example, that over one million farms were created in the 1870's without the aid of such laws.[7]

Decade	New farms	Homestead original entries	
	- - - - - - - Thousands	- - - - - -	Percent
1860s	616	142	23
1870s	1,349	319	24
1880s	556	477	86
Total	2,521	938	37

It was not until the 1880s that a close relationship between new farms and homestead entries appeared. For the 30 years between 1860 and 1890 original entries were 37 percent of new farms.

During the 1860s the Homestead Act played only a minor role in land settlement in some north central States. Gates presents the following comparison of new farms and homestead entries in the Midwest:[8]

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[5] Robert P. Swierenga, Pioneers and Profits: Land Speculation on the Iowa Frontier, Iowa State University Press, Ames, 1968, p. 207.

[6] Roy M. Robbins, Our Landed Heritage: The Public Domain, 1776-1936 (Lincoln: University of Nebraska Press, 1962), p. 217.

[7] Gates, History of Public Land Law, pp. 401-2.

[8] Ibid., p. 401.

State	New farms	Homestead original entries	
	- - - - - - thousands	- - - - -	percent
Illinois	57	0	0
Missouri	56	13	23
Iowa	55	7	13
Michigan	33	12	36
Wisconsin	34	10	29
Indiana	29	0	0
Minnesota	28	26	93
Kansas	28	13	46
Nebraska	10	16	160
Total	330	97	29

The main reason why homesteading was not particularly important in most north central States was that much of the land had already been taken up by investors, realtors, or speculators who were busy selling to bonafide settlers. As a result, the number of new farms far exceeded homestead entries, and only 8 percent of the land in the nine States was homesteaded (Table 1).

In contrast, in the five Great Plains States 40 percent of non-federal, non-Indian lands was homesteaded. Kansas was lowest with 25 percent and South Dakota highest with 47 percent (Table 2).

In 11 Western States 34 percent of non-federal, non-Indian lands was homesteaded, and in Colorado, Idaho, Montana and Wyoming, more than 50 percent. Despite these high figures there is little reason to believe that homesteading was necessary since settlement of two-thirds of the lands was accomplished without the aid of these laws.

Many Homestead Entries Commuted for Cash

Many of the original homestead entries were never carried through to final entry and patent but were quickly commuted for a cash payment of $200 a quarter-section. Gates points out that while some entries were commuted "to gain quick title to resell to cattlemen, lumbermen and speculators. . . . many legitimate settlers found it either necessary or economically desirable to borrow the $200 to pay for their improved claims so that they could mortgage their farms for $500 to $1000 or more

Table 1.--Acreage and percentage of land on which homestead final entries were made, 1862-1966, seven selected north central States

State	Total land in State[a]	Total non-federal, non-Indian lands[a,b]	Homestead final entries: Acres entered[c]	Homestead final entries: Percentage of total land in State	Homestead final entries: Percentage of non-federal, non-Indian land
	- - - - - - 1,000 acres	- - - - - -			
Illinois	35,311	35,311	6	*	*
Missouri	44,248	42,487	3,644	8	8
Iowa	35,860	35,665	903	3	3
Michigan	36,492	33,198	2,322	6	77
Wisconsin	35,011	33,071	3,111	9	9
Indiana	23,158	22,762	2	*	*
Minnesota	51,206	47,099	10,390	20	22
Total	261,286	249,593	20,378	8	8

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[a] *Public Land Statistics, 1967*.

[b] *Statistical Abstract of the United States, 1967*.

[c] U.S. Department of the Interior, *Homesteads* (Bureau of Land Management, 1962).

* Less than 0.5 percent.

Table 2.--Percentages of land on which homestead final entries were made, 1862-1966, 17 Western States

State	Total land in State[a]	Non-federal, non-Indian lands[a,b]	Homestead final entries: Acres entered[c]	Homestead final entries: As percentage of total land in State	Homestead final entries: As percentage of non-federal, non-Indian land
	- - - - - 1,000 acres	- - - -			
Arizona	72,688	20,586	4,135	6	20
California	100,207	55,297	10,479	10	19
Colorado	66,486	41,696	22,149	33	53
Idaho	52,933	18,128	9,757	18	54
Nevada	70,264	8,149	711	1	9
New Mexico	77,766	44,344	89	*	*
Oregon	61,599	28,725	10,515	17	35
Utah	52,697	15,400	3,616	7	24
Washington	42,694	27,648	8,466	20	31
Montana	93,271	60,400	32,063	34	54
Wyoming	62,343	30,450	18,227	29	60
Subtotals	752,948	350,823	120,207	16	34
South Dakota	48,882	40,720	19,158[d]	39	47
North Dakota	44,452	41,510	19,166[d]	43	46
Nebraska	49,032	48,244	22,282	45	47
Kansas	52,511	51,840	13,089	25	25
Oklahoma	44,088	41,186	14,866	34	36
Texas[e]	(168,217)	(165,560)	(0)	—	--
Subtotals	238,965	223,500	88,561	37	40
Totals	991,913	574,323	208,768	21	36

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[a] *Public Land Statistics, 1967*. [b] *Statistical Abstract of the United States, 1967*, p. 206. [c] U.S. Department of the Interior, *Homesteads*; *Public Land Statistics, 1962 through 1966*. [d] Assumes one-third of 5,244,345 acres approved for homestead final entries were in North Dakota and two-thirds in South Dakota. [e] Homestead laws did not apply to Texas because Texas has had no federal public domain.

* Less than 0.5 percent

to enlarge and make more efficient their operations. Others needed to salvage something from their blasted hopes in struggling to make a living on land not fit for farming." In either event, President Theodore Roosevelt's Public Land Commission of 1902 found that in Minnesota, homesteads were being commuted for $200 a quarter section and transferred to other parties, most often on the same day, at the following rates:

Agricultural areas	36 percent
Timber areas	89 percent
Mineral areas	96 percent

In the agricultural area the commuters were of three kinds: (1) farmers who commuted so that they could live and work off the farm, (2) immigrants and others who failed or were forced to quit, and (3) retired farmers, bankers, business and professional men, clerks, and school teachers who were solely interested in making a profit.

Public and Private Sales and Preemption of Federal Lands

Continued Despite Passage of Homestead Act

Was one goal of the homestead laws the replacement of public and private sales of federal lands? If so, then it was largely a failure since more than 60 percent of new farms were created without these laws. With the Homestead Act of 1862, 84 million acres were open to unlimited purchase and were not withdrawn.[9] The fact is that ten days after he signed the Homestead Act, President Abraham Lincoln ordered that 4.4 million acres in Williamette Valley of Oregon be offered for sale. This was followed by several other offerings during 1863 and in 1864, by some 3.7 million acres in Minnesota. In all, 11.9 million acres were offered for sale during the Lincoln administration.[10]

It was not until 1889 that public and private sales of these lands were ended, and the Commissioner of the General Land Office declared that "the great objective of the government is to dispose of the public lands to actual settlers only--to bona fide tillers of the soil."[11] This, of course, was the clear intent of the homestead laws, but why did it seem necessary for the government to become involved in the land

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[9] Gates, History of Public Land Law, p. 395

[10] Ibid., pp. 435-6.

[11] Ibid., pp. 461-2.

market and the creation of farms? Gates notes that in any case the government failed in the effort despite "much talk about saving the public land from the grasping speculators, the timber barons, and the cattle kings for the land hungry immigrant, the disposed tenant or mortgaged farmer of the Middle West or the New Englander who was tired of trying to make a living on his rockstrewn, thin soiled hills."[12]

Throughout history settlers have moved in or squatted on public and even private lands when this was the cheapest, easiest, or the only way to obtain a place to live. Laws denying them this right were ineffective or unenforceable. Gates notes that in the Pennsylvania Colony, land was legally available only by purchase but "with the coming of tens of thousands of Scotch-Irish and Germans--many without resources to buy and compelled by circumstances to move out to the frontier of the Colony--squatting became so common that it was estimated by 1726, doubtless with exaggeration, that as many as 100,000 immigrants had taken up and were improving land to which they had no title."[13]

Preemption--the right of the squatter eventually to gain title to the land without competition at auction for it--was the natural outgrowth of a situation where the demand for land was great, the resources for purchase often non-existent, and the supply unprotected and undefendable against the squatter. Virginia passed a preemption law in 1776, North Carolina in 1777, Pennsylvania and Massachussetts in 1787. In 1783 the Continental Congress issued a proclamation forbidding settlement on or sale of land north of the Ohio River. When this failed to deter squatters, troops were ordered to drive them out but with little success. Their numbers and political powers grew rapidly, and as a result Congress enacted the Preemption Act of 1841 which sanctioned squatting anywhere on the surveyed public lands. A decade later preemption was also allowed on unsurveyed land.

According to Gates the practical effects of the Preemption Act of 1841 were not great since claim associations insured that there would be no competitive bidding against local settlers and small speculators. "Preemption was abused in the years before 1860, but on the whole the fraudulent operations made possible by the Act of 1841 do not appear to have been extensive or significant. . . . After 1862, however, the situation was very different. The quantity of land proclaimed for sale, and thereafter opened to unrestricted entry was limited and soon the practice virtually ended . . . . Preemption then became subject to major abuse as did all the other entry laws. . . . Finally in 1891 after numerous recommendations by Commissioners of the General Land Office and land reformers, Congress provided for the repeal of a law that had long since passed its usefulness" for legitimate purposes.[14]

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[12] Gates, History of Public Land Laws, pp. 495-7.

[13] Ibid., p. 41; see also his Chapter X, "Preemption."

While squatting is no longer legitimized by preemption laws, it continues to be a problem in some areas of the West where homesites rather than farms are desired.

The Decline in Homestead and Desert Settlement

In 1920 nearly 14 million acres of federal public lands were entered under the various disposal acts. Since then there has been a sharp decline (Figure 2, Part II A). Between 1950 and 1966 an average of only 152,000 acres was disposed of annually (Table 3). In 1922 about seven million acres were disposed of under various homestead laws, but these disposals have also declined greatly (Figure 1, Part II A). An average of only 26,000 acres annually were disposed of by homesteading between 1950 and 1966 (Table 3).

Since 1950 the various homestead laws have accounted for only 21 percent of patents issued and 17 percent of the lands patented in the Western States. The Desert Land Act of 1877 has disposed of similar amounts with public auction accounting for almost 65 percent of patents issued and acres patented (Table 3).

What is the justification for three land disposal systems at the present time? Is there a need to subsidize land settlement under the various homestead laws and the Desert Land Act? If so why? These questions deserve careful study by the Public Land Law Review Commission before it makes recommendations regarding these laws. Stewart points out that the Desert Land Act was, in effect, an attempt to extend the homestead laws to arid lands of the West that could only be brought under cultivation by irrigation.[15]

Originally 640 acres could be acquired under the Desert Land Act, but in 1891 allotments under all disposal methods were reduced to 320 acres. The Desert Land Act differs from the homestead laws in that residence on desert land is not required. However, applicants must

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[14] Gates, History of Public Land Law, p. 246.

[15] Clyde E. Stewart, The Desert Land Act in Mid-Twentieth Century: Issues and Problems, U.S. Department of Agriculture, Economic Research Service, no. ERS-151 (1964), p. 2.

Table 3.--Average number and percentage of patents issued and acres patented, 1950-1966, 17 Western States

Method	Patents issued: Number	Patents issued: Percent	Acres patented: 1,000 acres	Acres patented: Percent
Totals for 17 years				
Homestead laws	3,531	21	438	17
Desert Land Act	2,553	15	530	20
Public auctions	9,817	64	1,614	63
Totals	15,901	100	2,582	100
Annual average for 17 years				
Homestead laws	208	21	26	17
Desert Land Act	150	15	31	20
Public auctions	577	64	95	63
Totals	935	100	152	100

Source: Tables 4 and 5, Part II A.

present evidence that they have permanent use of sufficient water to irrigate and reclaim all the irrigable portion of the land. The applicant must also invest $1.00 an acre in the land each year for three years after entry. In addition he must pay 25 cents an acre as a filing fee and $1.00 an acre when final proof is made. Thus the minimum total cost is $1,360 for 320 acres. Patent may be issued at any time within four years when the applicant has (1) spent $3.00 an acre for development, (2) "properly developed and irrigated" one-eighth of the land, and (3) acquired rights to an adequate supply of water.[16]

Thousands of applicants are rejected, but since 1877 when the Desert Land Act was passed, 164,000 entries have been allowed; however, only 57,000 made final entry and somewhat fewer received patents to their claims (Table 4). Of the 34 million acres entered only 10.6 million reached final entry, and most of these were patented. Between 1946 and 1961 the Bureau of Land Management classified three million acres of land, but only one million acres were declared suitable for entry, and only 284,000 acres, or 9 percent of the land, classified went to patent.[17]

The results of a study of some of the problems of land disposal under homestead and desert land laws have been presented in Part II A. Briefly this study shows that:

1. About 50 percent of the persons who received patents between 1950 and 1963 had sold them by 1969.

2. Enlarged homesteads averaged 199 acres but were attached to other lands for a total of 1,948 acres while desert land entries of 221 acres were attached to other lands for an average total of 1,719 acres.

3. Patented tracts, especially reclamation tracts, were frequently subdivided.

4. Very few applicants ever receive a patent to their claim.

5. The estimated administrative costs are unbelievably high--$25 per acre or more.

6. The frustrations of both applicant and administrators are very great.

The study concludes that:

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[16] Stewart, The Desert Land Act, p. 3.

[17] Ibid., p. 10.

1. The land should be classified as to its physical suitability for irrigation before entry is allowed, and ample water should be available.

2. Applicants should be carefully screened before they are permitted to apply.

3. Perhaps the entryman should be given some managerial assistance to meet the requirements for final entry and patent.

Apparently a great many of the difficulties have arisen from the lack of lands physically and economically suited for crop production with or without irrigation. This suggests that the 1.6 million acres of federal lands presently available and physically suited for intensive agriculture should be classified as a whole and then either thrown open for settlement or zoned for other uses. The present procedure is comparable to a city without zoning laws in which each householder or businessman must petition for the classification of the land on which he wishes to build before he buys the land. Zoning laws are often criticized, but their merits can be appreciated when the alternative is considered.

Even if the problems noted could be solved under the present three systems, the question remains--why three systems? No evidence has been found which suggests that the homestead or desert land laws are necessary to achieve maximum public benefits from the use of the remaining arable federal lands. On the other hand the evidence does suggest that unrestricted sale of the land might be harmful unless the land is first classified or zoned for its highest and best use.

The Decline in Available Federal Lands for Crop Production

Lack of federal lands economically suited for crop production may be the major cause of difficulty with disposal methods. At present there are only 1.6 million acres of arable federal lands considered available for crops in the 17 Western States (Table 5) including 0.7 million acres for dryland (a 1 percent increase) and 0.9 million acres for irrigated crops (a 3 percent increase). It needs to be emphasized that these acreages are estimated to be physically capable of producing crops--whether or not they are economically capable is quite another question. Some of the 0.7 million acres suitable for dryland crops are economically submarginal lands. The same may be true for some of the 0.9 million irrigable acres in view of current costs of developing such lands.

The foregoing historical background and the questions raised concerning past performance of the homestead-type laws have a bearing on several of the issues and alternatives to be discussed later.

Table 4. --Number of entries and acres entered under the Desert Land Act for selected years with totals for 1877-1908, 1877-1916, 1877-1966.

Selected years	Number of entries		Acres entered	
	Original	Final	Original	Final
			- -- 1, 000 acres- - -	
1877	731	---	269	---
1880	538	---	156	---
1885	2, 766	475	928	191
1890	1, 564	868	479	245
1895	1, 759	388	231	77
1900	3, 479	912	590	138
1905	4, 067	1, 293	711	226
1910	15, 620	2, 041	2, 900	324
1915	2, 681	2, 327	460	387
1940	8	77	1	12
1945	13	22	1	2
1950	146	60	27	10
1955	486	100	119	6
1960	213	179	54	40
1965	224	226	62	58
1966	133	178	38	43
1967	95	123	26	31
1877-1908	83, 899	28, 587	17, 662	4, 869
1877-1916	150, 785	39, 628	31, 398	7, 504
1877-1966	164, 756	57, 259	33, 961	10, 601

Source: U. S. Department of the Interior. Annual Reports of Director, Bureau of Land Management; Public Land Statistics (original sources). P. W. Gates (History of Public Land Law Development, p. 643) compiled all the data for 1877-1916 and the totals.

Table 5.--Private cropland harvested and arable federal lands held by Bureau of Land Management, Bureau of Reclamation and Corps of Engineers in 17 Western States

State	Private cropland harvested[a]			Federal arable public lands[b]			
	Total	Dryland	Irrigated	Dryland	Irrigated[c]	Dryland Increase	Irrigated Increase
	- - - - - - - - - - - - - - -	- 1,000 acres -	- - - - - - - - - - - -	- - -	- - -	- - Percent	- - -
Arizona	1,025	20	1,005	0.0	6.0	0	*
California	7,846	1,409	6,437	4.1	20.3	*	*
Colorado	4,726	2,682	2,044	103.4	85.9	4	3
Idaho	3,935	1,696	2,239	83.0	306.3	5	14
Kansas	18,160	17,312	848	26.2	0.0	*	0
Montana	7,813	6,433	1,380	104.9	5.2	2	*
Nebraska	15,229	13,167	2,062	0.7	1.0	*	*
Nevada	507	4	503	0.0	2.5	0	1
New Mexico	906	218	688	0.0	0.0	0	0
North Dakota	17,695	17,646	49	22.3	0.0	*	0
Oklahoma	8,344	8,084	260	2.5	0.0	*	0
Oregon	3,050	1,964	1,086	59.6	22.5	3	2
South Dakota	14,445	13,310	1,135	31.0	0.0	*	0
Texas	19,408	13,509	5,899	61.0	0.0	*	0
Utah	1,039	270	769	0.0	1.1	0	*
Washington	4,423	3,514	909	3.3	103.8	*	11
Wyoming	1,702	598	1,104	203.1	386.6	34	35
Totals	130,253	101,836	28,407	705.1[d]	941.2[d]	1	3

[a] 1964 U.S. Census of Agriculture, Vol. 2, Chap. 3, pp. 248-49.

[b] From Table 18 of Volume IV, Working Paper on Federal Public Lands Suited for Intensive Agriculture in Western United States.

[c] Water available

[d] The 705,000 dryland and 941,000 irrigable total 1.6 million acres. If Forest Service L.U. lands are added, the total would be 2.2 million acres. *Less than 0.5 percent.

B. SOME APPROACHES, GOALS, PROBLEMS AND ISSUES

Maximum Benefits for What Publics?

Few will deny that the federal public lands should be administered in a manner that will result in the "maximum benefit to the general public." However the "general public" is difficult to identify and its costs and benefits almost impossible to measure. There are, in fact, several publics or interest groups that are affected by public land policies as pointed out in the introduction to this volume (Part I C).

According to Clawson and Held, the people who use federal public lands are the ones most affected, most concerned, and most effective--especially in blocking legislation or administrative acts contrary to their interests.[18] These people and their associations make up four interest groups: (1) livestock producers, (2) timber harvesters, (3) mineral and oil developers, and (4) recreation, conservation and general resource use groups.

Recreational use of federal lands has been rapidly increasing and may now exceed 15 percent of the population. But as Clawson and Held note, "in spite of this large and growing use, most people in the United States know or care little about the federal lands. Many people do not use the lands because they live in areas where use would be difficult or because they lack the income to travel to the lands, or because they simply lack the interest. Few of these non-users are informed on or interested in federal lands. Even among users there are many who take the lands and facilities they use for granted, without concern as to their management."[19]

Since ranchers graze some 265 million acres in the West, the shift of 1.6 million acres of arable land from grazing or possibly hay production to intensive farming is likely to be of major concern only to the particular rancher affected. Yet ranchers may be particularly sensitive because other but related aspects of policy decisions may affect them more directly.

Only the Land Utilization lands under control of the Bureau of Land Management are included in the 1.6 million acres of arable public lands. Hence it seems unlikely that the forestry and timber harvesting interests will be particularly concerned about the development of these lands. Even less concern is apt to be expressed by the mining and oil interests since their operations do not conflict seriously with agricultural use.

Recreation and conservation organizations often are quite influential in legislation concerning the federal public lands. These organizations are likely to oppose the conversion of grazing lands to crop production even though the acreage available for such conversion is quite small. Historically, these organizations generally have opposed private use of public lands and can be expected to continue their opposition in the future unless it is clear that such use does not conflict with recreation, wildlife, and conservation.

Clawson and Held conclude that the associations representing these four interest groups "have been effective in influencing federal land management in the past. Their influence has been exerted in support of, or more frequently in opposition to, legislative proposals. They have also tried to influence administrative action at every level from the President down to the district ranger. No land managing official at any level dares ignore the existence of these interest groups, for they are likely to block his proposals if they seem harmful. At other times these associations may be helpful in securing needed legislation or administrative reform or popular support for an agency program."

Clawson and Held conclude that "as nearly as one can judge, political strength of the timber harvest, grazing, mineral development and, recreation--conservation--general resource interest groups is nearly balanced today. Each group is able to stop legislation or new administrative action that it finds highly objectionable, but at the same time no group is able to push through legislation or new administrative action that it wants, but that one or more of the other major groups oppose."[20] In the few exceptional cases the support of the general public has been secured on highly simplified and dramatized issues.

Not only are people represented by associations but also by Congressmen, State legislators, various legislative committees, and public agencies of federal, State, and local governments. All these groups seek to maximize the benefit of the general public as they see it. The difficulties and frustrations arise because they each see the public interest from different viewpoints. All have goals, objectives, or purposes, but unfortunately these are often in conflict because the "facts" may not be what they seem to be. Only careful study can make clear what the facts really are and resolve some of the problems of public land use and conservation.

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[18] Marion Clawson and Burnell Held, The Federal Lands: Their Use and Management (Lincoln: University of Nebraska Press, 1957). Their Chapter III, "Policy Formation and Decision Making," is excellent and is recommended reading in full.

[19] Ibid., p. 135.

[20] Clawson and Held, The Federal Lands, p. 141.

What are the Crucial Problems and Issues?

The identification of crucial problems or issues of any kind is not easy. As John Dewey has pointed, our problems are rarely self evident but are found in "a troubled, perplexed, trying situation, where the difficulty is, as it were, spread throughout the entire situation, infecting it as a whole. If we knew just what the difficulty was and where it lay, the job of reflection would be much easier than it is. As the saying truly goes, a question well put is half answered. In fact, we know what the problem exactly is simultaneously with finding a way out and getting it resolved. Problem and solution stand out completely at the same time. Up to that point, our grasp of the problem has been more or less vague and tentative."

Questions raised are of two kinds. "What should" questions are political or policy issues that ultimately may have to be answered in the political arena. These questions arise because of conflicts in goals or ideals of the various publics, and compromises often seem to be the only solutions.

The Public Land Law Review Commission was created to make recommendations to the President and the Congress primarily on the "what should" issues concerning federal public lands. In turn, the Commission has instituted studies to assist in providing answers to "what should" questions by answering "what are" questions like:

What are the crucial objectives of the various interest groups?
In what respects are these objectives similar?
What are the basic facts and possible consequences of alternatives courses of action to achieve these goals?

These and related questions will now be discussed.

C. Analysis of Issues and Alternatives:

In this section the sequence of policy questions first mentioned in Part I C are discussed and the alternatives evaluated. These policy questions are statements of issues put into "what should?" form. The approach is through the very practical subject of use of the lands and begins with an overall question: Should federal public lands be used for human purposes? This question is broader in scope than this study, but it seems sufficient to say here that most of the federal public lands are being used for some human purpose and that the demands of major segments of our citizenry relate to various practical or aesthetic uses. Only a small minority would want all these lands placed in a primitive reserve with all human access prohibited. An important portion of the foregoing question provides a practical starting point for analysis:

Should the federal public lands suitable for intensive agricultural use be so used? If so, why? (This refers to such lands now being farmed as well as suitable lands not being so used at present).

During most of our national history the answer to this question as reflected in our public land laws and our disposal programs has been "yes!" In recent years these earlier decisions have been questioned.

Several reasons for putting these arable public lands into agricultural uses have been stated frequently. These include:

To produce additional food and fiber for the nation and the world.
To aid the economic and social development of regions, States or communities.
To settle (occupy) the land.
To establish proprietorships (or family farms).
To serve or supplement another deserving use for the land.
To provide public revenues.

Each of these reasons for use or development requires consideration.

Should the public lands suitable for intensive agriculture be put to such use in order to produce food and fiber? Another way of saying this is: Do we need, or shall we soon need the potential production from these lands?

The survey of public lands in the 17 Western States showed about 2.0 million acres physically suitable for dryland farming and 1.3 million acres for irrigated farming where water for irrigation is available. (Another 35 million are irrigable but lack available water.) All of these together constitute a very small proportion of the 371 million acres administered by the seven federal agencies concerned and also a small proportion of the 130 million acres of privately owned cropland in the 17 States.

The first two categories above total 3.3 million acres suitable for cultivation, but some of these lands are reserved for other uses. A total of 1.6 million acres--0.7 million of potential dryland and 0.9 million acres of irrigable land--is held by the Bureau of Land Management, Bureau of Reclamation, Corps of Engineers and Forest Service (L. U. lands only) and is therefore considered to be readily available for crop

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[1] John Dewey, How We Think (Boston: D. C. Heath and Co., 1933), p. 108.

production. About one million of these acres are now being cultivated under leases or permits.

When the quantities of suitable and potentially available land are considered against the current and potential demand and against the quantities of suitable, available private lands, the evidence indicates clearly that these 1.6 million acres will not be needed now or in the foreseeable future to meet national demand for food and fiber. The rather detailed evidence to support this conclusion is presented in Part IV B of this report.

Will these arable public lands be needed to meet present or projected foreign demand by 1980? By 2000? Again the answer probably is negative for both years. The analysis shows that most of the less developed nations will not have the purchasing power to buy foods they will need and that there are definite limitations on the amounts of food which can or will be given to such countries. Even if current upward trends in exports of foods continue, there probably will be millions of acres of idle cropland in this country in 1980 despite expected increases in population at home and abroad.

Another related consideration nationally concerns specific major crops rather than overall production of food and fiber. Could the public lands produce a significant proportion of one or more necessary agricultural products more efficiently than could be produced elsewhere? The various major crops grown in the Western States were considered. Although their comparative advantages and importance varied, it does not appear that the use of public lands to increase the production of any one major crop will be necessary.

From regional or more local viewpoints there may be exceptions to the general conclusion that the production is not and will not be needed. For example, some product may be (or could be) produced efficiently close to its market by the use of nearby public lands. Information on this point is not available. Undoubtedly some of the lands would be suited for the production of specialty crops. The amount would vary with demand as expressed in prices. However, there are millions of acres of private land presently in extensive crops in the West that could also be used to produce specialty crops should demand warrant. In a competitive market system such as prevails in this country, the economic laws of comparative advantage usually will determine which lands will be used for specialty crops--provided the use of the land for various purposes is not restricted. If the public lands were classified and the arable lands identified and made available for purchase, the farmers could decide which lands were best suited for each crop. In general, it is doubtful if there is any serious lack of lands for specialty crops that could be dispelled by developing arable public lands.

The foregoing analysis does not cover specifically the situation of federal lands already in crop production under lease or permit. There are about 1,010,000 acres of such lands supervised by several federal agencies. Although the acreage involved is relatively small, it probably represents some of the better quality croplands in the suitable category. These lands are producing some products, and they must be taken into account in considering our degree of need for production from the public lands.

These special cases, namely special crops, special local exceptions, and the existence of current production on public lands, may suggest the need for some flexibility in future policy decisions. However, they do not alter significantly the overall conclusion that the nation does not need the potential crop production from federal public lands.

Should federal public lands suitable for intensive agricultural use be so used in order to aid the economic and social development of regions, States or communities?

A frequently stated justification for developmental projects, including federal lands, is that the increased economic activity will strengthen the community, State, region, and nation. Such justifications have some basis in the obvious fact that any development which brings in outside capital and additional people will create some business activity, at least in the short run.

The real questions in this subject area concern the amount, geographic distribution, and duration of such benefits as related to the available, suitable federal lands. Will such development, presumably with federal investments in selected localities, be of such value as to serve the national interest? Or will it provide such local and area benefits as to justify efforts to accomplish it even though it may not necessarily be in the national interest.

Several input-output studies in 11 Western States suggest that for every $100 of new crops produced there would be $30 to $40 indirect benefits, or total effects of $130 to $140 (See Part IV). Thus if 1.5 million acres of arable public lands are brought into production at present yields and prices, the direct output would be $85 million. If the indirect effect multiplier is 1.36, the total effect would be $115 million. Large as this is, it would be only a 2.0 percent increase in the value of all crops presently harvested in these 11 Western States.[1]

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[1] The six plains States are not included.

Similar results could be expected in local communities. For example, in Phillips County, Montana, if 23,500 acres of arable federal lands could be brought into production, the direct output effect at current yields and prices would be $352,000, or a 3.9 percent increase over current agricultural sales. If the indirect effect multiplier were 1.30, the total effect would be $458,000 a year.

If 30,000 acres of new federal lands were brought into irrigated production in Cassia County, Idaho, the direct effect would be an increase of about $5 million compared with $33 million presently produced. If the 1.30 multiplier were used for the indirect effect, the total effect would be about $6.5 million. Obviously this would have an important impact on the local community.

But such an analysis gives at best only a partial answer. What would be the effects of similar development in other parts of the country if land there could be developed more cheaply with less subsidy? What would be the comparative effects of developing other industries in these communities or States? These are questions that need to be answered before arable public lands are brought into production for the sake of local economies. Such questions can be answered only by careful analyses of probable costs and benefits of the alternatives under specific circumstances of a given community. No easy answers are available.

Should the federal public lands suitable for intensive agriculture be so used in order to settle (occupy) the land area?

In earlier periods of our nation's history, the settlement of new lands primarily for political or military reasons was an objective in its own right. Does this hold true for today and tomorrow? The earlier military and political justifications probably do not apply to most areas of the 48 contiguous States. However, looking toward the future, some attention must be paid to various proposals to reduce population pressures on large urban centers by settling more people on public lands in sparsely populated areas.

How many new families would these new lands support? A review of farm size studies indicated that if $5,000 is considered a minimum acceptable farm income, then 1,000 to 2,500 acres of dry cropland would be needed--depending upon the productivity of the land, its location and other assumptions. Thus if an average of 1,000 acres per farm is needed for a minimum adequate income, development of the 0.7 million acres suitable for dryland crop production would produce 700 new farms and support that many farmers.

If the 0.9 million acres of irrigable public lands were divided into 250 acre farms, then about 3,600 new farmers would be required in the 17 Western States. Studies of farm size in the West indicate that

250 acres would produce about $3,000 net returns to the farmer for his labor and management (See Part III B). The 700 dryland farms plus 3,600 new irrigated farms, if occupied by families of 4 persons, would represent about 17,200 additional people. Actually, some of these new lands might be used by local farmers and ranchers whose existing units are already much too small for economic operation and adequate incomes.

Could the people who might settle the 1.6 million acres of available land make a larger contribution to society in some other occupation or in some other place? Under the competitive private enterprise system this is a decision for these people to make. It seems questionable whether the federal government should provide incentives such as free land just to encourage settlement.

Should the federal public lands suitable for intensive agricultural use be so used in order to establish proprietorships or family farm units?

At times national policies to encourage ownership by establishing independent farmers (or family farms) have received strong support. Does this objective in itself justify putting the arable federal lands into intensive agricultural use?

Individual private ownership still is an objective of a large number of citizens and particularly so among farmers. National and State government officials reiterate support, in words at least, for this objective. To some extent, existing homestead type laws reflect this objective. However, as shown elsewhere in this report, such laws now are used seldom and with difficulty. At present, the opportunity to become relatively low income farmers, even as land owners, does not seem to have effective mass appeal in this country as shown by trends in the number and sizes of farms.

There are about three million farms in the country today, or about half the number of 30 years ago. These are expected to continue to decline to perhaps two million or fewer in the years ahead. Farms producing $10,000 or more in gross marketings annually have increased threefold since 1939 while commercial farms producing less than $10,000 have declined from four million to fewer than one million in the same period.

Farms are becoming larger partly because of larger and more efficient farm machinery. Six and eight-row equipment, for example, can cover many more acres than two or four-row equipment. To be profitable the high fixed costs of this modern machinery must be spread over larger acreages. However, if a family farm is defined as one that employs less than 1 1/2 man-years of hired labor, 95 percent of all farms are family farms. This figure has changed little for many years.

Obviously the development of 1.6 million acres of arable public lands into approximately 700 dryland farms and 3,600 irrigated farms would make only a small contribution to the preservation of family farms. In view of the fact that more cropland probably will not be needed in the foreseeable future, development of this land to create family farms seems questionable.

Should the federal public lands suitable for intensive agriculture be so used in order to serve (or supplement) another desired use for the land?

Intensive agricultural use may be supplemental to some other primary use. For example, some crop production is permitted on lands in wildlife preserves provided the federal rent share of the crop is left standing for wildlife feed or cover. As another example, in some forested areas the existence of farms provides a winter labor force for lumbering plus summer employment on the farms. In other cases it may be desirable to permit some cropping on public lands in order to make fresh garden produce available in season to resorts adjacent to public lands. Finally and more important, extensive livestock enterprises which use public grazing lands sometimes require feed bases (permanent meadows in cultivated forage lands) which may be public lands also.

Such examples illustrate that justifications may exist for using some public lands for intensive agriculture. They do not measure the extent of such use or potential use which, however, is not thought to be of great significance nationally but may be of considerable importance in some localities.

Should federal public lands suitable for intensive agriculture be so used for other reasons?

Some citizens feel that federal lands should be sold to bring current revenue to the government. Probably a considerably larger number believe that all suitable lands should be put into private hands and on the tax rolls in order to strengthen local government units as well as to reduce federal costs of supervision and operation. Such views usually are expressed with regard to all public lands rather than to arable lands only or specifically.

With regard to the arable lands, past experience has shown that disposal of public lands does not provide any large gross revenue, and quite possibly no net revenue, to the federal government. For example, between 1934 and 1966 the federal government received only $835,930 from Homestead Act fees, $955,664 from Desert Land Act fees, and $14,609,896 as proceeds from land auctions (Volume III, page 25).

The considerations of potential tax revenues to local governments and of administrative costs were not included in this study. Both are complex matters. Another consideration not studied is the potential costs of other federal public services which would be necessary if additional public lands were developed for intensive agricultural use.

Despite the foregoing uncertainties it can be assumed that considerations of potential public revenue or savings will continue to be a force directed at transfer of public lands to private use and ownership.

Another justification for intensive agricultural use of suitable public land exists but is difficult to categorize. Some people just want some public land either for intensive agriculture or for some other use, and they wish to obtain it under the acts relating to such lands and uses. Their reasons vary, but they constitute a small but sometimes influential force favoring the disposition and use of such lands.

Before summarizing the evidence on the foregoing questions, it is desirable to mention a related matter.

Should federal public lands not considered suitable for intensive agricultural use be used for intensive agriculture?

This statement is neither a contradiction in terms nor a purely academic topic. During much of our history public lands considered not suitable for intensive agricultural uses were so used, at least for periods of time, and even now examples of these uses exist. Some people found ways to succeed on such lands, but many failed.

Valid differences of opinion exist as to what constitutes suitability for intensive agricultural use. Furthermore, technological, economic, and other changes may alter definitions of the area over time. Definitions used by individuals often are weighted in favor of economic gain--usually, but not always, gain from actual productive use of the land. Definitions used by administering agencies tend to reflect the mission and policies of those agencies.

In this study the estimates of acreages suitable for intensive agriculture necessarily were based quite heavily, although not exclusively, on surveys and estimates of the U.S. Soil Conservation Service and other agencies concerned with protecting lands from physical harm. It can be assumed, therefore, that the resultant estimates are biased slightly on the "safe" side.

Intensive agricultural use of what some might consider unsuitable lands is not in itself a reason for or against intensive agriculture. It does pose a caution to policy decision makers. There is no sharp, lasting boundary line between suitable and unsuitable lands. Rather, there is a band of disputed territory which varies in width from place to place and is subject to change over time.

In summary, there are public lands considered suitable for intensive agricultural use, and some of these are being so used under permit. Other tracts in selected areas are being sought by would-be developers. However, there cannot be said to be a great rush for these lands.

The foregoing analysis does not provide support for a single overall policy on this issue. Certainly no clear-cut, recognized need exists to push all suitable public lands into cultivation. On the other hand, enough reasons and exceptions exist to weaken any justification for the alternative of prohibiting all intensive agricultural use on all federal public lands. Left, then, are a large number of alternatives intermediate between total use and total prohibition of use which make necessary the consideration of various policy questions relating to how such lands may be put into intensive agricultural uses.

If the federal public lands suitable for intensive agriculture are to be used for this purpose, how should this be accomplished?

Many critical issues of arable public lands are included in this policy question. Usually each such issue leads to subordinate questions and to various alternative courses of action. Selected issues are discussed under these headings:

Utilization Considerations
Tenure Considerations
Price, Cost,and Revenue Considerations

Selection of issues and alternatives discussed below was arbitrary but was based on suggestions from staff members of the Commission, the legal contractor, and other advisors. Some alternatives listed are stated positively rather than as questions but are not intended as recommendations. For each of these some description and evaluation are presented. For the most part the description omits technical legal analysis because such information is presented in the report of the legal contractor.[2]

Utilization Considerations

Three issues (questions) will be discussed here:

Which public lands should be developed for use and how should they be classified?
Should public lands entered upon for agricultural purposes be restricted to agricultural use?
Should there be restrictions upon the types or sizes of intensive agricultural units developed on public lands?

Which lands should be developed for use and how should these be identified and classified? Should the 1964 Classification and Multiple Use Act be made permanent? Until 1934 the location or selection of lands as suitable for crop production was left largely, but not entirely, to the settler. The Taylor Grazing Act of 1934, the 1964 Classification Act, and the 1964 Public Land Sales Act do not permit entry of a settler until the land is classified as chiefly valuable for agriculture and opened for entry under one or more of the agricultural disposal laws. The main criticism of these laws is that they give the Secretary of the Interior some policy making as well as administrative duties.[3]

ALTERNATIVE: Establish an independent board to identify and classify public lands suitable for agricultural use.

The main advantage of this alternative is that the Secretary of the Interior would be freed from criticism that he is biased in favor of government ownership. An independent board of distinguished citizens could be created in each State with a staff of soil scientists, ecologists, economists, and other qualified persons to prepare data for classification.

Should public lands entered upon for agricultural purposes be restricted to agricultural use? The basis for proposals to restrict the future use of lands acquired from the public seems to be that such lands obtained under agricultural acts soon become real estate developments, cabin sites, or individual sites. Presumably this need not be a problem on public lands which are leased or permitted to private users. The federal government can stipulate the terms of use.

Efforts to stipulate and control the future use of public lands after title has passed to private owners could be difficult and quite possibly undesirable. A title thus restricted could freeze the land in a less than optimum use or substantially lower its market value. The restriction might well become obsolete under changing circumstances.

There seem to be two separate problems. The first is the possibility that arable public lands obtained for agricultural use may be converted to other uses. Is this in itself harmful? Should the government expect to dictate to the owner after a patent is issued?

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[2] Kronick, Moskovitz, Tiedemann and Girard, "Legal Study of Federal Public Land Laws and Policies Relating to Intensive Agriculture," (Public Land Law Review Commission, 1968), Volume I of this study report.

[3] Kronick and others, "Legal Study of Public Land Laws and Policies," Chap. 6, Volume I of this study report.

The second problem is that former public land may be diverted to an undesirable use or become a burden upon the public. Probably this hazard can be forestalled by appropriate zoning ordinances rather than by federal restrictions on the land title.

No formal alternative is proposed because this issue was not studied in depth.

Should there be restrictions upon the types or sizes of intensive agricultural units developed on public lands? Various public land acts place limits (160 or 320 acres) upon the amount of public lands which can be acquired by one settler. If the object of the various homestead and desert land laws is to create viable family farms, these limits may contribute to the defeat of this effort. In some areas of the West 320 acres of irrigated cropland or 600 acres of dryland are needed to produce a net income of $5,000--the amount needed to keep a family consisting of parents and three or four children above the poverty line. For more details see Part III B of this volume and also Volume IV. Working Paper on Federal Public Lands: Economics of Farm Size in Western United States.

Because of prior water rights, short growing seasons, and low yields on irrigated land, 15 projects have been granted exemptions from the 160-acre limitation policy of the Reclamation Act. What has not been fully recognized is that similar variations may exist on any one project. Not only does the land vary in yields, but the operators vary greatly in managerial ability, need for income, and in kinds of crops grown.

The present law discriminates between single operators and heads of families because under the Reclamation Act of 1902, husband and wife can each receive irrigation water for 160 acres of irrigated land. A son or daughter also may hold 160 acres and receive irrigation water from a federal irrigation project.

Apparently, one of the purposes of such acreage restrictions was to prevent any one person from acquiring large amounts of public lands, especially where rather large public investments had been made as on public irrigation projects.

ALTERNATIVE: Remove the acreage limitations from the acts which now require them and from existing and new irrigation projects.

This alternative's main advantage would be that there would be more likelihood that adequate incomes would be obtained.

The disadvantages would be that the number of farms might decrease somewhat and the average size of farm would increase. There could also be complaints that the lack of acreage restrictions would permit development of large holdings and large incomes on federal projects.

Tenure Considerations

Four issues (questions) are included:

Should the Homestead and Desert Land Acts be repealed? Should public lands be disposed of as freeholds or as leaseholds? Should arable public lands be transferred to States for retention or disposal? Should States and local governments have a larger voice in policy decisions affecting (1) land settlement (2) use of water and (3) additional costs to State and local governments as a result of land development?

Should the Homestead and Desert Land Acts be repealed? The operations of these land laws have been severely criticized by applicants, administrators, and research workers. About two-thirds of lands disposed of by the federal government is by sale. Only about one-sixth is disposed of by homesteads and one-sixth by desert land entries.

Only about 200 homesteads and 150 desert land entries per year have gone to patent in the 17 Western States since 1934. More details on the results of these laws are presented in Part V A and in Part II of this volume and need not be repeated here.

ALTERNATIVE: Repeal the Homestead and Desert Land Acts and continue the Public Land Sale Act of 1964.

The main advantage would be to eliminate what often appears to be an opportunity to realize windfall profits but all too often becomes a trap in which both private and public resources are wasted with negative effects on the general welfare. There are no apparent economic disadvantages to the repeal of homestead laws and Desert Land Act.

Should arable public lands be disposed of as freeholds or leaseholds? Leasing of arable public lands to farmers is practiced to some extent in Western Canada, Australia, and New Zealand under conditions similar to those of the western United States. It should be noted that in Australia practically all Crown lands were transferred to the States in 1890, and in Canada the Dominion transferred its public lands to the Provinces in which these lands are located. Hence the leasing is handled by the various States and Provinces. In general long term leases of from 15 to 40 years duration have been used, but some permanent or 99-year leases are also in use. Often the tenant has first chance at renewal. Some of the leases are preliminary to sale or homesteading of the land. The tenant's fixity of tenure gives him much freedom to improve and to manage at what appears to be a fair rent.

Despite the long terms and freedom to improve the properties, problems do arise and are not easily resolved short of granting the land to settlers as freeholds. However, the longest term leases, and particularly the permanent leases, give the farmer almost as much right over the land as if he owned it. Nevertheless, most farmers prefer freeholds, and most governments are providing means by which freeholds can be secured from arable public lands.

In the United States where public policy has favored freeholds from the beginning, even permanent leases may appear a poor second choice although the differences between such a leasehold and a freehold may be small indeed.

From the farmer's viewpoint the main advantage of the freehold is that it provides the maximum degree of freedom. From the standpoint of the government, granting the freehold provides relief from many difficult, cumbersome, and costly decisions about land management, land use, and fair rents.

The freehold also gives the farmer the maximum incentive to conserve and improve the land. If he has sufficient land to achieve a satisfactory income, there is a tendency for any surplus to be put back into the land as improvements. Part V A and B contain further discussion of these points. See also Volume IV, Working Papers on Federal Public Lands: Goals, Issues and Alternatives, for discussions of tenure, goals, and experience in Canada and Australia.

ALTERNATIVE: All single purpose agricultural lands could be sold as provided for under the Public Land Sale Act of 1964.

Such a decision would be in keeping with general public policy that most agricultural lands should be privately owned. It would eliminate the high costs of homestead and desert land entries and any questions of subsidy. Such sales would also be an automatic deterrent to unwise development of new lands when there are presently 60 million acres of idle private cropland as a result of price support programs.

ALTERNATIVE: Modify the statutes and regulations relating to leasing and permitted use of agricultural lands to provide for leases which allow the lessee more security of tenure and freedom to operate and improve the lands. Protect the government's necessary interests with appropriate clauses in the leases.

The advantages of such an alternative would occur mostly to the lessee but should be reflected in better land use and possibly in higher rental returns to the government. The disadvantages would be that the government would have somewhat less flexibility in the short run in dealing with the lessee.

Should arable public lands be transferred to States for their retention or disposal? Historically, there have been many suggestions and some actions to grant federal public lands to States. The Congress granted 229 million acres of federal lands to States and local government units for many worthy purposes during the period from 1787 to the present time. Included were grants of 78 million for common schools, 65 million for reclamation of swamplands, 37 million for construction

of railroads, 22 million for institutions, and 28 million for other purposes.[4] Most recently Alaska, upon attaining statehood, received the right to select 103 million acres of federal lands. From time to time considerable thought has been given to the possible advantages of transferring part or all of the federal public lands to the States. In 1860 a homestead bill passed by Congress, but vetoed by President Buchanan, provided that all federal lands not sold within 30 years after being offered, would be ceded to the States in which they were located.[5]

The Irrigation Congress at its annual meetings in 1891, 1892, and 1893 strongly urged that all public lands be ceded to the States in which they were located.

In 1913 the Conference of Western Governors urged that the federal lands within their borders be transferred to the States, and this request was repeated the following year.[6]

In 1929 President Herbert Hoover proposed that the surface rights of some 235 million acres of unreserved federal public lands be conveyed to the States in which they were located to be used for public school purposes. His Committee on Conservation and Administration of the Public Domain reported in 1931 that areas important to national defense, reclamation, national forests, national parks, and bird refuges should be reserved or retained by the federal government but the remainder--mostly grazing lands--should be ceded to the States in which they were located as soon as they were prepared to accept and administer them.[7] All the Western States except Utah favored the plan, and it had the support of livestock producers with some exceptions. However the States also wanted the mineral rights and possibly some parts of the national forests.

In 1931 a group of agricultural economists who were to play an important role in the New Deal farm program held a conference on land utilization and maintained that the public range lands should be retained and managed by a federal agency "in a manner similar to and in coordination with the national forests." Conservationists opposed cessation of the public lands and journals of opinion supported them.

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[4] Public Land Statistics, 1967, Table 3. For more details on these grants see P. W. Gates, History of Public Land Law Development (Washington, D.C.: Government Printing Office, 1968), Chapters XII and XIII.

[5] Gates, History of Public Land Law, p. 393.

[6] Ibid., p. 516.

[7] Ibid., pp. 526-7.

In 1946 a bill was introduced to convey to the States in which they were located the unappropriated and unreserved federal public lands, lands reserved because of their minerals, and lands in the Taylor grazing districts.

In 1954 Secretary of the Interior, Douglas McKay, spoke of the need to determine which of the federal lands "should be retained in federal ownership, and which can be most economically and satisfactorily administered by transfer to State or private ownership."[8]

To summarize--there has been some interest in transferring federal lands to States, particularly grazing lands. Apparently there has been little or no concern about the transfer of arable lands, probably because these were so few as to escape notice.

What might be the consequences of transferring federal public lands to the States? Some light is shed on this question by the experiences of Australia and Canada. Australia transferred its public lands to its States in 1891 and Canada its public lands to its Provinces in 1930. In neither case has there been any movement to reverse these transfers. While the land policies of the various Australian States and Canadian Provinces differ, no evidence has been found that these transfers are considered to have been a mistake despite the variety of methods used in disposing of the land.[9]

As noted, President Herbert Hoover expressed the view that the States, all of whom have agencies to manage State lands, "are today more competent to manage" the federal public lands than is the federal government. There are logical reasons for believing that this is an accurate appraisal of the situation. The State governments are much closer to the public lands and have a major stake in their development or use. Because they are close to the problems, they should be able to develop more satisfactory leasing or sales arrangements and to handle problems that might arise. For these and other reasons stemming from one's philosophy of government a good case can be made for transferring some, perhaps all, of the federal lands to the States in which they are located.

But has State land management been superior to federal management? At first glance the answer seems to be negative. Kelso has pointed out that "the record of public land management by States and counties in the West shows no example of public land management of a quality comparable to most of that of the federal government."[10] Yet Kelso's statement raises other questions. What constitutes high quality management of public lands? Should either the federal or State governments be involved in the details of land management of agricultural lands? Cannot farmers and ranchers be trusted to conserve the land provided they are given adequate fixity of tenure and freedom to improve and to manage? There is little literature on the subject. Hence the transfer of Federal public lands to States deserves careful study as to its effects on farmers and ranchers and the land.

Should States and local governments be given a larger voice in policy decisions affecting (1) land settlement, (2) use of water, and (3) additional costs to State and local government units as a result of land developments. This issue is closely related to the previously discussed issue of possible federal land transfers to States. Certainly State governments and probably local governments also would have more influence over public land policies after such transfers were made. Actually, the States seem to have a strong influence in formulation of national policy concerning such subjects as land settlement and use of water. Their representation in the Congress tends to assure this. Their basis for complaints seems to center more on federal operating policies on land and water programs which affect the local citizens and sometime result in added costs for local and State governments.

It seems that the channels and methods exist by which local and State interests and governments can influence federal policies of all types. Therefore, no alternative is suggested.

Price, Cost and Revenue Considerations

Two issues (questions) are included here:

If arable public lands are to be disposed of as freeholds, what price, if any, should be charged for the land?

Should federal investments be made in development of irrigation for arable public lands?

Under the several existing federal acts the charges for public lands vary from small fees to the market price at auction. For example, during the period 1934 to 1966 homestead fees averaged $.12 an acre; desert land charges and fees, $1.32 an acre; and public auctions, $8.99 an acre (See Part II or Volume III). Of course the homestead and desert land laws required services "in kind" on lands that were usually lower in value than these sold at auction. But is it in the public interest to continue to accept payments in kind under the homestead and desert land laws, or should these laws be abolished in favor of public auction sales?

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[8] Gates, History of Public Land Law, p. 630.

[9] For further details see Paul O'Rourke, "Public Land Disposal by Leasehold and Freehold in Canada, Australia, New Zealand and the Netherlands," Volume IV, Working Papers on Federal Public Lands: Goals, Issues and Alternatives, of this report.

[10] M. M. Kelso, "Current Issues in Public Land Management in the Western United States," Journal of Farm Economics 29 (November 1947), pp. 1310-11.

ALTERNATIVE: Repeal the homestead and desert land laws and continue the Public Land Sale Act of 1964.

This alternative has been presented before in this report, and the advantages and disadvantages previously given will not be repeated here. In the specific context of this policy issue, however, it should be noted that the advantage to the government would be the assumption of receiving not less than the fair appraised price, perhaps more, at auction. The possible disadvantage would be that in some situations there may be a lack of bidders, hence no competition.

What level of public expenditure is necessary to develop the water inputs? The federal government has made substantial investments in the development of arid lands in the West, and because the more easily irrigated lands are largely exhausted, costs are increasing; for example, in 1959 the Bureau of Reclamation estimated the average cost of developing 9.5 million acres of new irrigated land at $921 an acre, but the development of 2.7 million acres of new non-federal lands was estimated to cost only $313 an acre. In contrast, there are millions of acres of land that can be cleared of brush, stone, or trees, and drained for less than $200 an acre.

The federal government has retired from production about 60 million acres of private land, and it appears that despite the expected increase in population and demand for food, there will still be at least 25 million idle acres by 1980. No shortage of land is expected in the foreseeable future. (For more details see Part IV B or Volume IV, Working Paper on Fede
Public Lands: Their Potential Contribution to Food and Fiber Needs, 1980 an
This means that decisions concerning development of additional arable public
for irrigated agriculture must take into account these relatively unfavorabl
economic factors.

If arable public lands are not to be used for crop production, how can such use be prevented?

The existing system of laws and regulations makes it possible, at least in most cases, to withhold arable public lands from intensive use. It has been shown earlier that the system is rather cumbersome and depends rather heavily on administrative rulings and procedures to accomplish such a purpose.

If the objective is to prevent intensive agricultural use of some arable public lands while permitting it on others, several alternatives previously listed can be combined.

ALTERNATIVE: Continue, or make permanent, the Classification and Public Sales Act of 1964. Repeal the Homestead and Desert Land Acts.

The classification procedures could then be used to prevent some arable lands from being farmed. In the special case of arable public lands now being farmed under lease or permit, such arrangements would need to be terminated under the pertinent regulations and terms. The advantages for the federal government would be that the desired result could be obtained somewhat more effectively and flexibly than at present but without new specific legislation. The disadvantages could be that the accomplishment of this objective might be unpopular with users or would-be users of the lands concerned.

If the objective is to prevent all arable public lands from being used for crop production another approach could be used.

ALTERNATIVE: By permanent legislation, prohibit intensive agriculture uses on all federal public lands.

Should public lands be used for crop production? Obviously much of these lands cannot be so used, yet 1.6 million acres appear to be arable and if water can be physically, economically and legally provided another 35 million acres could be used for crop production. With population in the United States expected to increase by 75 percent in the next 30 years legislation prohibiting the use of these lands for crops may be unfeasible even though there seems to be no need for this land for crop production in the foreseeable future.

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APPENDIX

WORK STATEMENT

FOR THE

STUDY OF FEDERAL PUBLIC LAND LAWS AND POLICIES RELATING TO INTENSIVE AGRICULTURE

1. Introduction

The Public Land Law Review Commission, established by the Act of September 19, 1964, 78 Stat. 982, 43 U.S.C. §§ 1391-1400 (1964), as amended by the Act of December 18, 1967, 43 U.S.C.A. § 1394 et seq. (February 1968 Pamphlet) has the statutory responsibility to (1) "study existing statutes and regulations governing the retention, management, and disposition of the public lands"; (2) "review the policies and practices of the Federal agencies charged with administrative jurisdiction over such lands insofar as such policies and practices relate to the retention, management, and disposition of these lands"; and (3) "compile data necessary to understand and determine the various demands on the public lands which now exist and which are likely to exist in the foreseeable future."

This is one of a series of studies designed to provide a basis for carrying out the statutory directive that the Commission recommend to the President and the Congress "such modifications in existing laws, regulations, policies, and practices as will, in the judgement of the Commission, best serve to carry out the policy" that "the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide the maximum benefit for the general public."

2. Objectives and Scope of the Study

a. Specific objectives

The study will set forth (1) the law and administrative practices relating to agricultural use of public lands, (2) data concerning the present and potential suitability of public lands for intensive agriculture, and (3) the economic and social factors relating to and affected by the use or disposition of public lands for intensive agriculture.

b. Scope of study

(1) Definition of Intensive Agriculture:

For the purposes of this study, intensive agriculture is considered to be the production of crops other than range forage, including small grain and hay.

(2) Lands to be studied:

Section 10 of Public Law 88-606 requires the Commission to study and submit recommendations on the following Federal lands: (a) the public domain of the United States; (b) reservations, other than Indian reservations, created from the public domain; (c) lands permanently or temporarily withdrawn, reserved, or withheld from private land laws, including the mining laws; (d) outstanding interests of the United States in lands patented, conveyed in fee or otherwise, under the public land laws; (e) national forest; and, (f) wildlife refuges and ranges.

For the purposes of comparison this study will also obtain and analyze information concerning lands acquired under the Bankhead-Jones Farm Tenant Act, 50 Stat. 522, as amended, 7 U.S.C. §§ 1010-12 (1964), which have characteristics similar to, or are managed in conjunction with lands described in Section 10. Public lands in Alaska are excluded from this study because the PLLRC is conducting a separate Alaska study where those matters pertaining to intensive agriculture will be considered.

The lands described above will be referred to as "public lands" in this study.

(3) Laws and agencies involved:

(a) Disposals for agricultural development

Congress has enacted, over the last 100 years, a number of statutes designed to encourage the development of public lands for agricultural purposes. These include the homestead, 43 U.S.C., Chapter 7 (1964); desert land, 43 U.S.C., Chapter 9 (1964); Indian allotment, 25 U.S.C. § 334, 336 (1964); and reclamation, 43 U.S.C., Chapter 12 (1964) laws; the Carey Act, 28 Stat. 422, as amended, 43 U.S.C. § 641 (1964) and the Public Sale Act, 78 Stat. 988, 43 U.S.C. §§ 1421-27 (1964).

All the public domain lands outside of Alaska to which these laws apply have been withdrawn from entry under these laws either by Executive Order 6910, of November 26, 1934, as amended; Executive Order 6964, of February 5, 1935, as amended; or by inclusion in a grazing district pursuant to Section 1 of the Taylor Grazing Act of June 28, 1934, 48 Stat. 1269, as amended, 43 U.S.C. § 315 (1964). Section 7 of the Taylor Act, 43 U.S.C. § 315f (1964) authorizes the Secretary of the Interior "in his discretion, to examine and classify any lands withdrawn or reserved (by the two executive orders) or within a grazing district, which are more valuable or suitable for the production of agricultural crops than for the production of native grasses and forage plants, or more valuable or suitable for any other use than for the use provided for under this Act. . . . and to open such lands to entry, selection, or location for disposal in accordance with such classification under applicable public land laws . . . ." The Federal Power Commission also makes withdrawn public lands available for entry under laws administered by the Secretary.

(b) Leases and permits for agricultural development

Various public land management agencies permit the use of public lands under their jurisdiction for agricultural purposes under leases or permits. These include the Bureaus of Land Management, Sport Fisheries and Wildlife, and Reclamation, Department of the Interior; Forest Service, Department of Agriculture; Department of Defense; and Atomic Energy Commission.

3. Legal Study Requirements (Study to be performed by Legal Contractor and reported separately)

a. Review and analysis of existing legal system

The objective of this portion of the study is to provide the Commission with a complete description of the existing system of laws, regulations, policies and practices governing the disposal or use under lease or permit of public lands for intensive agricultural purposes.

For the legal systems governing intensive agricultural uses on public lands described above, the study will review all relevant provisions of the statutes and their administration, including delegations of authority, as reflected in executive orders and directives, agency regulations, manuals, directives, declarations of policy, court decisions, legal opinions, agency decisions, and all standard Federal permit forms, licenses, leases, etc., prescribing the conditions for intensive agricultural uses.

It will describe the statutory guidelines, if any, for the administration of each statute and indicate whether the administrative actions implementing the statutes are consistent with such guidelines and among themselves. Where administrative actions cover matters not expressly treated in the statutes, the study will review the legislative history and indicate whether any expressions of legislative intent or guidelines for administration are available from that source and, if so, whether the administrative acts are consistent with such guidelines and among themselves.

b. Scope of Review:

Review and describe the laws, regulations, etc., grouped under the following subject areas:

(1) Disposals for agricultural development

(a) Review the disposal statutes, including those listed in Appendix A, covering such basic matters as land classification criteria and procedures, qualifications of entrymen, lands subject to entry, acreage limitations, annual and final proof requirements and procedures, public and private contests, provisions for extensions of time and other forms of relief, terms, reservations, and conditions in patents, assignment of entries, provisions for disposition of improvements if an entryman fails to "prove up," and exercise of supervisory and equitable powers of the Secretary of the Interior.

(b) Describe the following areas in detail:

(i) Classification criteria. What criteria are considered and what procedures employed in the exercise of Secretary of the Interior's discretionary authority to classify lands as suitable for disposal under the agricultural land laws. List the criteria most frequently cited by the Secretary as grounds for refusal to classify.

(ii) Qualifications of entrymen. Are there provisions for group or corporate development?

(iii) Final proof requirements. List the requirements most frequently cited by the Secretary as grounds for rejection of final proof.

(iv) Acreage limitations. What are they? What authority is there for administrative flexibility in applying the basic acreage limits? Identify statutes which have expressly waived acreage limitations in specific situations and the stated rationale for such waivers. In the absence of legislative waivers, what legal techniques have been used to attempt to lessen the impact of the acreage limitations, such as, for example, ownership by husband and wife, and/or minor children; joint tenancy and tenancy in common; trusts, corporations and limited partnerships; leases; and mortgages. To what extent have these techniques been sanctioned by the Department of the Interior? In this sub-part emphasis will be placed on the Congressional rationale underlying the basic statutory acreage limitations as revealed in the legislative history.

(2) Leases and permits for agricultural development

Review such matters as criteria used by the various agencies to determine whether public lands will be made available for agriculture use, lands subject to lease or permit, qualification of individuals, acreage limitations, terms and condition of leases and permits, and provisions for disposition of improvements if leases or permits are terminated. What special circumstances, such as use in trespass, are considered in issuance of lease or permits?

c. Comparative review of other existing legal systems

The objective of this part of the study is to provide, for the states listed, a limited description of the laws and policies related to disposal or use of state lands for intensive agriculture. Administrative regulations and their equivalent will be reviewed only where constitutional or statutory provisions appear inadequate to provide a general understanding of the laws and policies of these other jurisdictions.

Provide a summary, comparative review of the laws and policies which provide for intensive agricultural use either through disposal or under lease or permit, pertaining to lands owned by the states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. This review will highlight the four subject areas specified for detailed treatment in part 3b supra.

d. Identification of problem areas and matters meriting particular consideration

Identify all problem areas and matters appearing to warrant particular consideration by the Commission as indicated by review of the existing legal systems, with sufficient explanation to permit understanding of the issues and factors involved and their effect on the operation of the system

e. Identification of possible alternatives

(The objective of this part of the study is to list and analyze possible changes in existing law or policy or alternatives to such existing law or policy that have been proposed or might be considered in order to provide for the retention and management or disposition of public lands for intensive agricultural uses in a manner to provide the maximum benefit for the general public. The listing of these modifications or alternatives will be developed primarily from information available from such sources as bills introduced in Congress, Federal agencies, reputable non-Government sources, such as user groups and public land scholars and commentators, as well as any suggested changes or alternatives that may suggest themselves to the contractor in light of his review of both the Federal and state laws and policies as required above.)

Submit as early as possible, but not later than 60 days prior to the date designated for submission of the draft report, a list of possible modifications or alternatives to the existing system of laws and policies governing the retention, management, and disposition of public lands for intensive agricultural uses, describing each change or alternative in summary fashion, including the proposed elements of each with sufficient analysis to understand the general impact of each but without any conclusion or recommendation as to which, if any, should be adopted. The contractor will present an objective summary of the arguments advanced for and against each change or alternative described.

(N.B. - Because the legal study is being accomplished under a separate contract, provision will be made for submission of the above required listing and analysis in segments or portions with the final list being due as required by the above paragraph. The segments as received, as well as the final listing and analysis, will then be made available to the contractor responsible for accomplishment of the resource study, the requirements of which follow.)

4. Resource Study Requirements

In this part of the study, data will be obtained on the operation of the laws relating to intensive agriculture, both dry land and irrigated, on the public lands. Data will be obtained for the 17 contiguous western states in the case of land disposal laws and for the 48 contiguous states in the case of permitted use. Data relating to the extent of resource development resulting from actions of the land laws will be assembled and analyzed to show the effects of these laws on settlement, land development, and the operation of farm units. Estimates of the suitability of public lands for agricultural use under current and prospective technology will be made, with consideration given to the availability of water for irrigation. This section of the study will also provide data necessary to appraise the experiences of farm operators who developed their farm units based on land recently obtained as a consequence of opportunities afforded by the agricultural land laws. The regional economic impact of incremental farm production in the West will also be explored.

a. Entry and disposal under the agricultural land laws, 1934-1966.

Classify and tabulate information on land disposed of under the Public Sale Act of 1964 for agricultural purposes and on homestead (original, enlarged, reclamation, National Forest, and other) and desert land entries and patents, including number of entries and acres involved, number of patents and acres involved, and number of entries and patents denied, by states annually for the period 1934-1966. Tabulate also total price paid and price paid per acre by the States annually for the same period. Present data in tabular, graphic, and map forms to be agreed upon after recommendations by the contractor and approved by the Commission.

b. Permitted use of public lands for agriculture, 1957-1966

(This section will present data and other descriptive material to show the area of public lands made available for agricultural development under permit, the kind of use to which these lands are put, and payments to the Federal Government for such use.)

(1) Classify and tabulate acreage of public lands used for intensive agriculture under permit, by states, annually for the period 1957-1966. Classify by major type of crop and by irrigated and nonirrigated acreage.

(2) Tabulate payments to the Federal Government for use of land indicated in 3b(1) above by same classifications, and fees or rates used as the basis for determining such payments.

c. Disposing of land for intensive agriculture uses

This section will depict the recent operation and administration of present disposal laws, regulations, and agency practices. Information is to be obtained from the available literature and study of selected case files of disposals of public lands for agricultural purposes since 1955. This will include ten case studies for each major disposal authority, selected as broadly representative of original and final entries and patents granted for sales under each authority.

Information for this section of the study shall include collection and analysis of data on:

(1) Time interval between actions in processing applications, by kind of action;

(2) Success in proving up the entry or reasons for failure;

(3) Obtaining water for irrigation, including securing of ground and/or surface water rights;

(4) Attainment of settlement objectives of the laws;

(5) Factors taken into account through initial classification of lands and periodic field examination in determining the allowability of original and final entries.

In the analysis of the data, the contractor shall classify and summarize problems of land classification for agricultural entry or disposal, and analyze the difficulties of proving availability of irrigation water, problems of time extension, ability to meet proof requirements, and others.

d. Economics of farm operation as related to agricultural land laws and existing public lands

This section will present a review of available information on the economics of intensive agriculture in representative irrigated and dry land farming areas of the 11 western states. Information presented shall cover at a minimum, the following:

(1) Effect of farm size on costs and net income for representative cropping patterns. In particular, the contractor shall compare typical per acre costs, capital requirements and net farm incomes for 160 acres, 320 acres, and larger farm units.

(2) Regional differences in capital and annual operating costs and net income for different size farm units. At a minimum, the contractor shall provide information relating to irrigated farming in the Snake River Valley in Idaho, Nevada or eastern Washington or Oregon, Southern California or Arizona and dry land farming in eastern Montana.

(3) Costs, including capital requirements, of providing irrigation water from both ground water and surface water sources as related to size of unit for which such water is provided. At a minimum, contractor shall provide such information for surface water sources in the Snake River Valley of Idaho and for ground water sources in Nevada or eastern Oregon or Washington.

e. Experience of farm operators

This section will provide data describing the use to which lands patented under the agricultural land laws between 1950 and 1960 have been put. It will be based on 75 case examples selected by the contractor in consultation with PLLRC to represent a range of conditions and laws: 25 examples will be selected to represent actions taken under the Desert Land Act, 25 will represent actions under the Reclamation Homestead Act, and 25 will represent actions under the other homestead acts (original, enlarged, and others).

Information to be collected and provided for each case is as follows:

(1) Legal authority for the patent, year, and location;

(2) Acreage patented;

(3) Agricultural crops and acreage under cultivation shown in the patent application or at time of patent;

(4) Current ownership of patented area, if different from the original patentee;

(5) Current acreage under cultivation and crops being produced;

(6) Size of farm unit to which the patented land belongs;

(7) Value of improvements on the patented land;

(8) Estimated annual income of owner of patented land.

f. Area of public lands suitable for intensive agricultural development

The contractor will develop, in consultation with Federal land managing agencies, the Soil Conservation Service, state agricultural experiment stations, and other state agencies, estimates by state of the area of public domain and the area of those classes of acquired public lands as defined by Section 10 of P.L. 88-606 which are suited for intensive agricultural development. Separate data shall be included for those LU lands and Grass Lands not covered under Section 10 of P.L. 88-606. This is intended to be an estimate based on available data and informed judgment, not on new intensive field classification of lands. The following steps are required:

(1) Classify and estimate area of public lands physically and economically suited for dry land crop production under prevailing management practices; provide estimates of the fair market value of similar private lands which have been developed for agriculture in the same localities.

(2) Classify and estimate area of public lands economically suited for irrigation and for which water is potentially available or expected to be available by limited number of probable crop classes, including water to be provided by presently authorized reclamation projects; provide estimates of the fair market value of similar private lands which have been developed for agriculture in the same localities.

(3) Classify and estimate area of public lands suited for irrigation but for which water is not presently legally or physically available under existing patterns of water rights and water use.

Land areas shall be classified in this section according to their current status, i.e., unappropriated public domain, public domain encumbered by withdrawal or reservation, and other public lands included in the scope of Commission studies, including lands withdrawn for Reclamation purposes for which water has not been delivered, and according to current major use. Acreage of lands suited for irrigated or dry land agricultural production shall be so identified. Criteria to be used in identifying lands suited for agricultural production shall be stated explicitly. Explanation of sources should indicate the extent to which estimates are developed from soil surveys, agency land classification or other records, or from judgment estimates of specialists.

g. Effect of development of new agricultural lands on a local economy

This section is to present an analysis of changes in a regional economy brought about as the result of the development of new agricultural lands. The analysis will be based on changes that have occurred in the economy of a county or counties in Idaho, northeastern Montana, and Arizona, or in other regions recommended by the contractor and approved by the Commission. The contractor shall select in consultation with PLLRC a county or two-county study area in each of the designated regions based upon changes in the agricultural land base since 1950, with particular emphasis on public land activity, accomplished and potential. The economy of the county or counties selected for study will be essentially oriented to agriculture, but with an urban trade center large enough to allow the contractor to identify and analyze the multiplier effect of changes in the agricultural sector upon the other sectors of the local economy. The analysis is to be based on information available from various government and other reports and shall provide answers to the following questions:

(1) What changes have taken place in the economy of the study area between 1950 and the present in terms of such measures as population, employment, per capita, and per family income, and local property tax collections?

(2) What changes have taken place in the agriculture sector of the study area, including changes in number of farms, average size of farms, farm and per farm income, farm employment, and cropping patterns?

(3) To what extent can the economic development of the study area and changes in area and individual wealth positions be attributed to the development of agriculture on new lands? Segregate effects on population, employment and income for agriculture, agriculture-related industry, and other export base industry or activity. Identify major developments that have taken place in the nonagriculture sector that have influenced development of the regional economy.

(4) On the basis of available information, identify and quantify, to the extent possible, changes in the economy of the study area that could take place during the next decade as a result of the development of additional new agricultural lands.

h. Potential future role of public lands for intensive agriculture

This section is to provide a summary of present and projected (1980 and 2000) acreages needed to supply projected national agricultural requirements, and to present an analysis of the effects on established production patterns and on national agricultural supplies resulting from probable development of existing public lands suited for intensive agriculture.

Agricultural supply and demand and agricultural land requirements situation and projections can be summarized from studies and projections prepared by the Food and Fiber Commission, the Economic Research Service, in the PLLRC Demand Study, and other sources. Estimates of expected productivity (yield) of major commodities for public lands considered suitable for agricultural development based on section 3f, above, are required.

On the basis of available information, compare marginal production costs per unit of production for increasing production of specific intensive agricultural crops on selected areas of public lands physically available for agricultural development with lands already in intensive agricultural production or withheld from agricultural production under Soil Bank or similar programs. Identify economically efficient patterns of increasing agricultural production.

5. Analysis of Existing and Alternative Systems

(The purpose of this section of the study is to provide a summary analysis of the findings of sections 3 and 4, above, as they bear on the disposal or use of public lands for intensive agriculture and to specify and explore the probable effects of possible alternative systems of laws and policies concerning such disposal and use.)

a. Based on the description of the existing legal system in Section 3, above, and on the information in Section 4, above, identify and describe the allocative and distributive effects of major features of the existing laws providing for the disposal or use of lands for agricultural purposes (primarily the various homestead laws and the Desert Land Act). The following questions are indicative of the type of analysis that will be required:

(1) What factors have apparently resulted in the relatively few applications and patents under the agricultural land laws in recent years?

(2) To what extent, if any, do the agricultural land laws encourage production of surplus crops? To what extent, if any, do these laws encourage regional shifts in agricultural production?

(3) Do features of the existing laws restrict or encourage the allocation of capital to the development of new lands under the agricultural land laws and, if so, in what ways does this occur? To what extent do the existing laws encourage or restrict the allocation of capital to these lands as compared with similar, nonpublic lands?

(4) To what extent is there justification for making public land available for intensive agriculture at less than the market value?

(5) What effects, if any, do the agricultural land laws have on local economic development and on average farm income in regions where lands are being developed under these laws? Do features of the existing laws restrict average farm incomes and, if so, in what ways does this occur?

(6) What effects do the existing agricultural land laws have on the organization of farms in the areas where agricultural land laws have been operative in recent years as compared with the organization of farms in other regions?

b. In addition to the alternatives to the existing system of agricultural land laws identified in Section 3, based on work required by Section 4, identify and analyze such additional alternatives to the existing system as may appear to warrant the attention of the Commission. For selected alternatives from the two indicated lists agreed upon by the contractor and Commission, and based upon the information developed in Section 4, identify and describe the probable allocative and distributive effects of the major features of the alternative. The following questions are indicative of the type of analysis that will be required for each alternative:

(1) To what extent and in what way will the alternative encourage efficient use of private capital in the development of new agricultural lands from existing public lands?

(2) To what extent will the alternative tend to change average farm incomes in the area where public lands are to be

developed for agriculture? What is the probable effect of the alternative on the economy of the local area?

(3) How will the alternative affect the local allocation of water supplies where irrigation from either surface or ground water is necessary for agricultural development of new lands?

(4) What effect is the alternative likely to have on the organization of existing farms in the local area and in other regions?

(5) What is the likely effect of the alternative on total national production of agricultural crops, particularly those now classed as surplus? Will the alternative cause regional shifts in the production of agricultural crops?

(6) To what extent, if any, will the alternative encourage the allocation of more capital to the development of new agricultural lands than would occur if the lands were now private?

6. Timing of Study: Final Report

The contractor will be required to commence work immediately, and to submit for approval, within 30 days after award of contract, a proposed outline of a report which is to embody the results of the research and analysis required herein. This outline will be accompanied by a work schedule which discusses the timing and nature of principal work phases entailed in meeting the requirements of the contract leading to draft manuscript, and a brief description of the manner in which the contractor proposes to accomplish the work defined in each phase.

The report outline will be reviewed and, if necessary, revised by the Project Officer. Subsequently the Project Officer and Contractor will have whatever consultations are necessary to arrive at the outline that will be used for the final report.

The contractor will be required to submit a draft report to the Commission for review two months prior to the date set for submission of the final report. This draft report of the study will be returned to the contractor in time for the contractor to make the necessary changes and/or additions in the study before reproduction of the 200 copies of the final report is begun. The final report shall be in accordance with a format approved by the Project Officer and shall be accompanied by a summary report briefly reviewing significant findings of the study.

All citations of authority will be in accordance with the rules contained in the tenth edition of "A Uniform System of Citation" published by the Harvard Law Review Association. Findings will be reported in appropriate form, including, in addition to narrative text, such graphs, tables, charts, maps and similar visual aids as may be necessary to provide clarity and facilitate understanding. Other questions of style will be governed by the Government Printing Office Style Manual.

7. Progress Reports

The contractor will be required to furnish brief but informative monthly reports on the progress of the study. In addition, he will be required to make personnel carrying out the project available, after reasonable notice, for consultation with PLLRC staff members on the progress of the study.

Progress reports will include the following items:

a. Statements of substantive research accomplishments of the previous month, together with a statement of how this research ties in with the work statement and the outline of the final report to be supplied by the Contractor 30 days after the signing of the contract;

b. The research plan to be used during the next month of study, together with a statement of how this research relates to the work statement and the outline of the final report;

c. For both items a and b above, a statement of how they correspond to the critical time path of the study;

d. Supporting evidence of accomplished research. This evidence can take the form of preliminary write-ups of chapters of the draft report, or may be working papers which will feed into preliminary chapters of the draft report. By the time the second progress report is made, the Contractor shall make every effort to document statements of progress with these preliminary chapter drafts or working papers. The Contractor shall make available to the Project Officer all preliminary chapters of the draft report before they are received in draft report form.

8. Federal Agency Contacts and Data Procedures

Arrangements for coordination between the Contractor and the Federal agencies, members of the Advisory Council, and Governors' Representatives necessary to carry out the study will be made through the Project Officer.

The procedures and design of any case study field work must be provided to and approved by the Project Officer before the work is begun.

Questionnaires or forms to gather information proposed for use by the Contractor must be provided to an approved by the Project Officer before their use.

The Contractor shall make requests for data and information from Federal departments and agencies through the Project Officer. Upon request of the Contractor, PLLRC will obtain or make the necessary arrangements for documents not otherwise readily available to the public, e.g., handbooks, manuals, case files, and similar internal working documents.

9. Key Personnel

In conducting this study, the Contractor shall utilize the following personnel who are considered to be essential to the performance of the contract, and none shall be replaced or reassigned without the prior written approval of the Contracting Officer:

Max Myers

Russell Berry

Roy Bodin

Frederick Westin

Canute Johnson

Edward J. Daniel

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